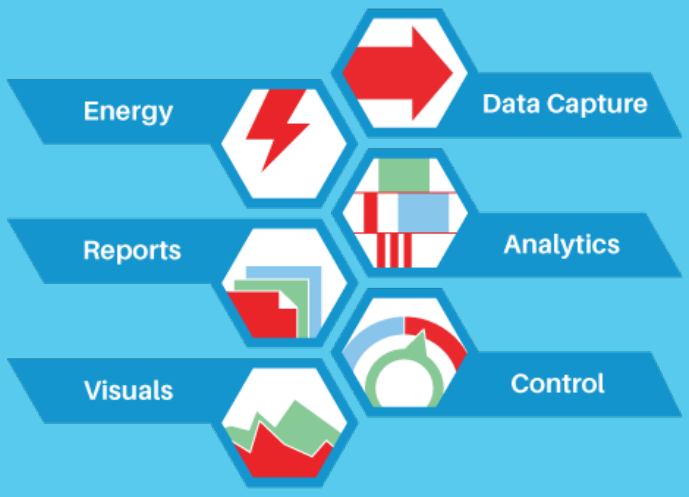
Tipify

Distributed • Scalable • Secure

IoT Technology for Smart Buildings Energy and SmartGrid



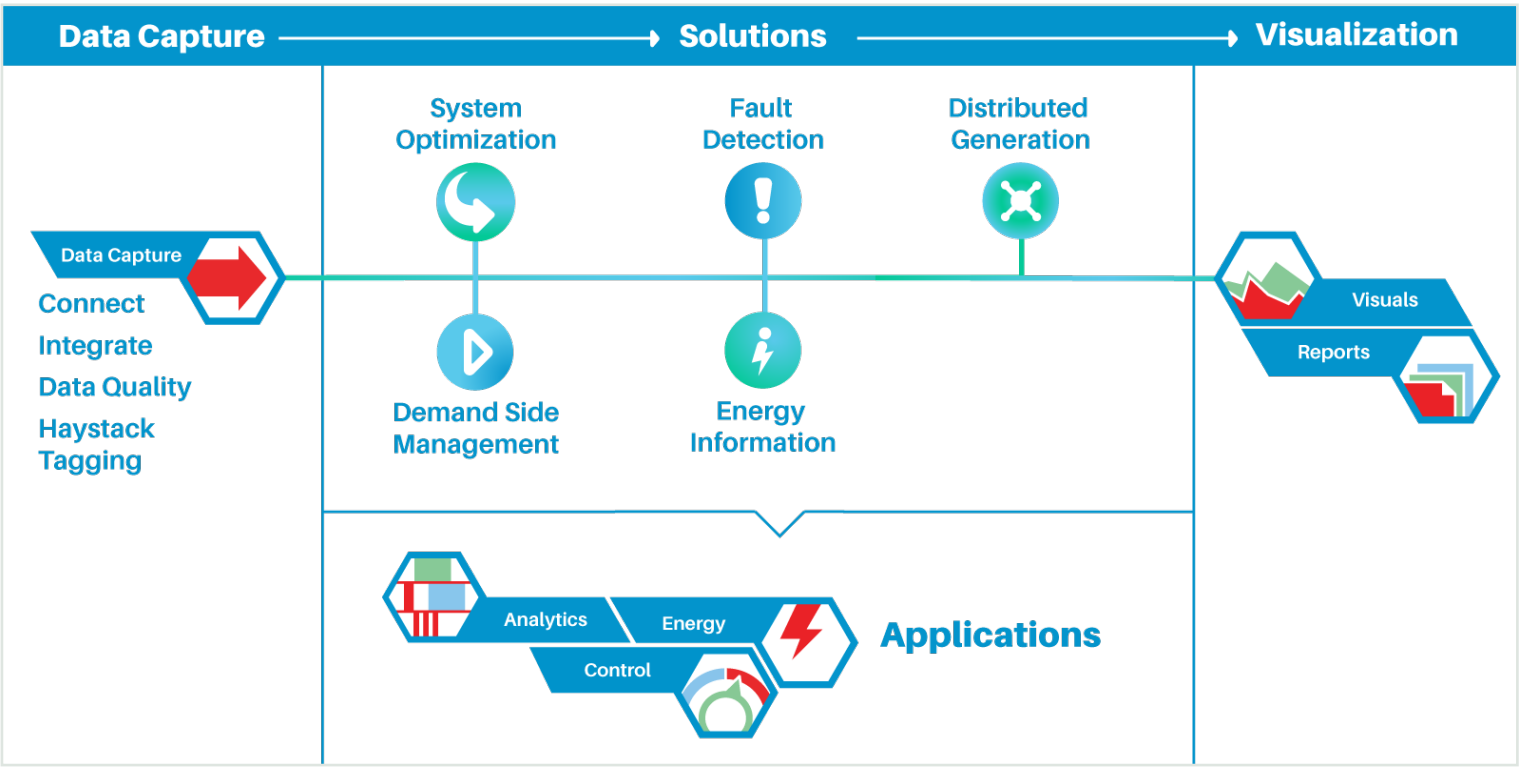
What's New In Tipify

- **Distributed Architecture**
  Seamless transfer of Data and Results between any Nodes in System
- **Secure Authentication**
  Authentication using Asymetric Cryptographic Key Pairs
- **Dashboard Visualization**
  Flexible and Composable Views
- **Folio 3 Data Base**
  Faster, more compact
- **Server Clustering**
  Seamless scaling and expansion
- **Fully Web Based**
  No Browser Plugins
- **Report Generator**
  Extended and enhanced
- **Data Quality**
  NA data type characterizes dubious data
- **Commercial Model**
  Based on points only

Contents

Intellastar

What is Tipify?



Tipify provides an end to end Technology Solution for Building & Energy IoT

- Smart Buildings Solutions
  - Energy
  - Analytics
  - Optimization
- Smart Grid Solutions
  - Demand Side Management
  - Demand Response
  - Distributed Energy Resources

Tipify Technology brings advanced IoT capability to Smart Buildings and Smart Grid for Service Providers to reduce Energy and Services costs.

end to end IoT Technology

Tipify is an advanced IoT Technology, used by Service Providers, primarily for Smart Building Applications to reduce Energy Consumption and Cost, and for Smart Grid Solutions including Demand Side Management and control of Distributed Energy Resources to control how and when energy is used so as to optimize resources and cost.

The Tipify System is high performance, fully distributed, hugely scalable and inherently secure. It runs in T-Star Edge Devices that are deployed in the Buildings and in Enterprise Server software that can be run in local Servers, Data Centers or on Cloud services.

The System Integrates with existing Building and Energy Systems, and provides an Energy Information and Management System, Edge and Server based Analytics, Control, Visualization and Reporting.

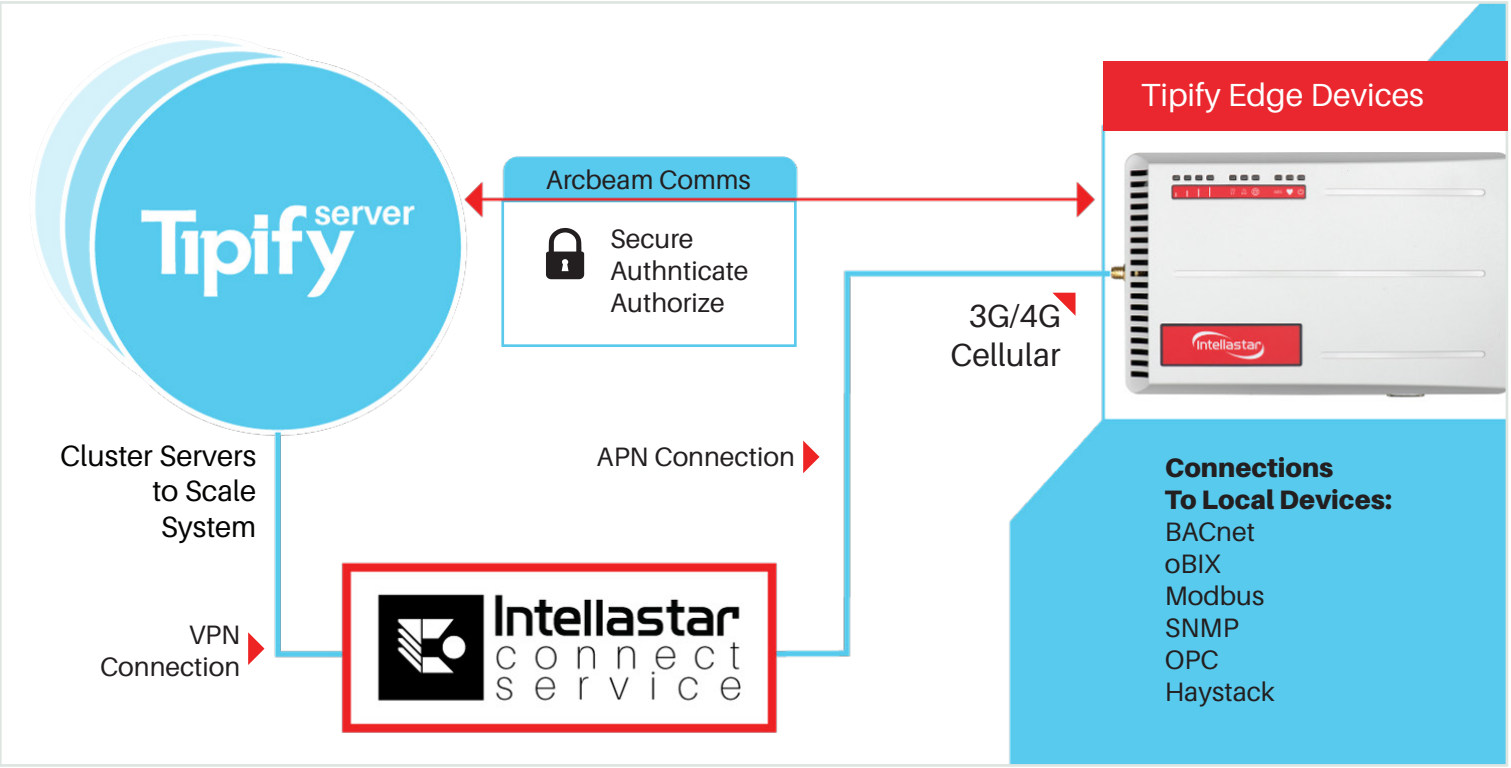
Intellastar Connect is a cellular Data Service used to securely connect Edge Devices in remote buildings to the Enterprise Server.

Tipify is the latest generation of Intellastar technology and is compatible with earlier versions all of which can be easily upgraded. It is built on the SkyFoundry SkySpark V3 Everywhere software platform and uses the Haystack Tagging and Data Model.

www.skyfoundry.com

www.project-haystack.org

Tipify Architecture



Fully Distributed Achitecture with T-Star Edge Devices, Tipify Servers & Connect Cellular Data Services

- T-Star's in Buildings with Edge Analytics
- Enterprise Server Software
- Connect Cellular Data Service
- Scales to thousands of sites and millions of data points
- Inherently Secure Architecture

Tipify System Architecture is
Fully Distributed
High Performance
Hugely Scalable and
Inherently Secure

Fully Distributed Architecture

Tipify Architecture comprises T-Star Edge Devices located in each building, Connect Cellular Data Service connecting T-Stars to Servers, and Tipify Server Software to run at Enterprise and NOC level.
T-Star Edge devices are located on site and run a fully featured Tipify Software Stack with Analytics. They integrate with existing systems through multiple protocols including BACnet IP, Modbus TCP and RTU, and perform Data Tagging and Modeling to the Haystack Standard.
The T-Star can either perform Analytics locally and share results to the Enterprise Server for system wide viewing or can transmit the tagged, modeled data to the Server for analysis there.
Tipify is provided as Enterprise Software and can be deployed by the users on local Servers, data Centers or Cloud Services such as AWS or MicroSoft Azure to suit the use case.
Projects can span multiple Tipify Servers and users are able to seamlessly view their projects without needing to know where the data is physically located.
This Views method allows multiple Servers to cluster together directly and the overall Tipify System to scale to thousands of Buildings and millions of Data Points.
Edge to Server Communications uses ArcBeam, an Authenticated Communications Protocol using Asymmetric Cryptology with Private/Pubic Key Pairs to provide device security.
Connect is a cellular Data Service. It provides connection plans for T-Stars to connect to Servers over 3G and 4G networks using secure network connections.

Tipify server

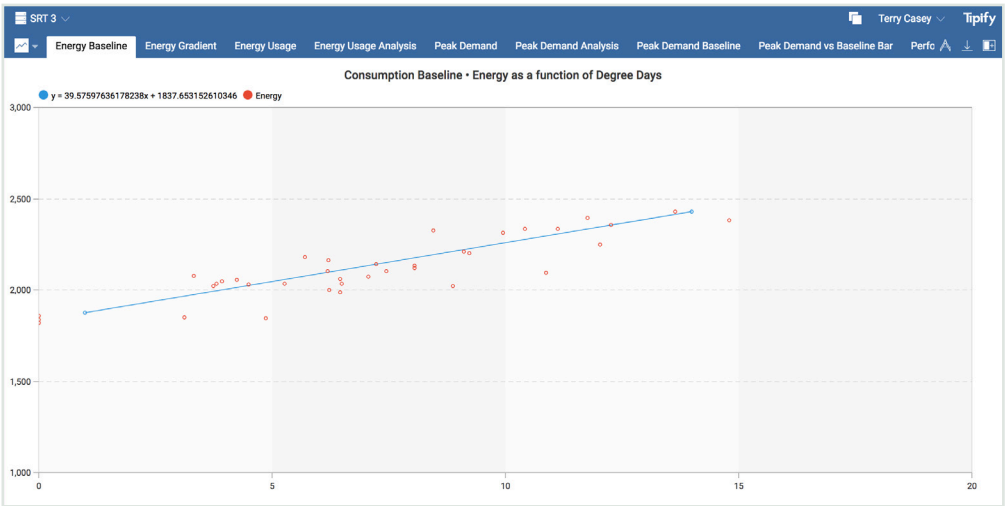
Bacnet
Modbus
OPC
SQL
SNMP
CSV
Rest API
Arcbeam

Tipify Server connects to mulitple data sources using a variety of protocols and a REST API

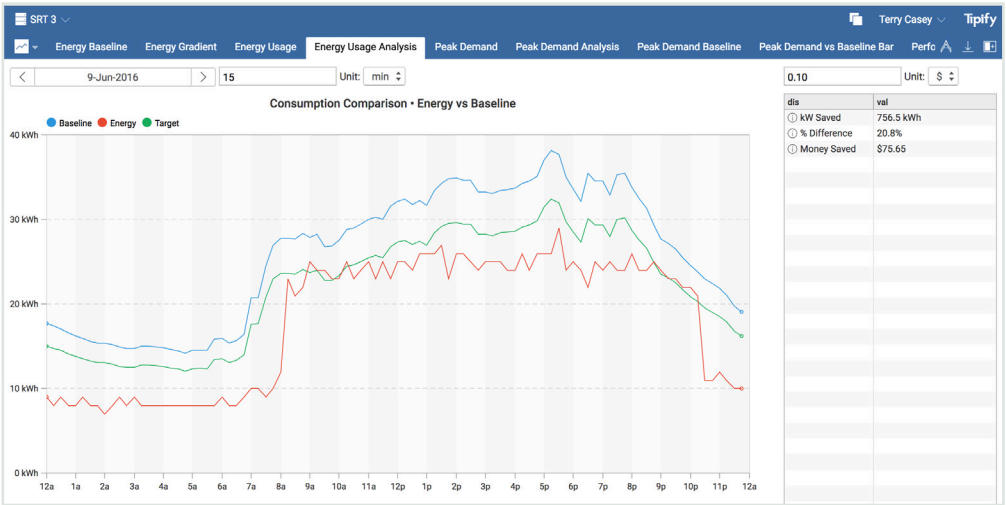
Applications

Energy

- Normalization
  Degree Day, Building Size
- Regression Analysis
- Baseline Calculations
- Targeting
- Energy Savings
  Computations
- CUSUM Calculations
- Visualization and Reporting



Degree Day Regression Analysis and Base Line



24hr Profile of Energy Consumption, Base Line and calculated Savings

Calculating Energy Savings

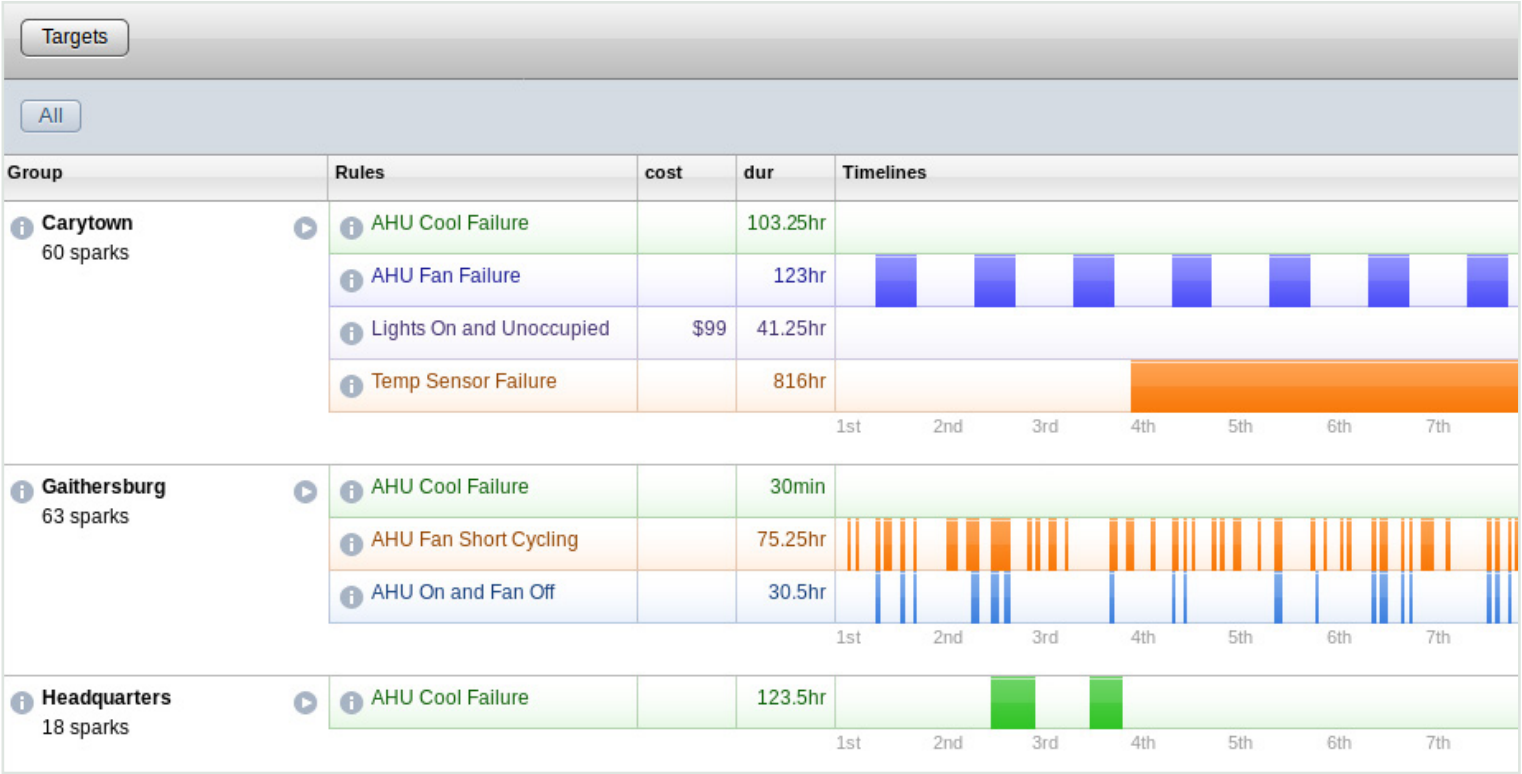
The Tipify Energy App is a powerful tool to process Energy and other consumption type Information.
Consumptions Data is captured by Meters connected to T-Stars or is imported from Utility Data or other sources using industry Standard formats such as oBiX, CSV files, Excel spreadsheets and Green Button.

Data can be rolled up into appropriate time periods, checked for Data Quality and Normalized. When analyzing Buildings, Degree Day and Building Floor size are the normal metrics, but other parameters can also be used.

Normalization unifies the data so comparisons between different Building and Locations Weather Data can be automatically gathered by the Weather Service using Geo-location of the site Regression. Analysis is used to create a Normalized Base Line for each Building that is used to set Energy Targets. Base Line and actual consumption are compared using CUSUM to calculate Savings.
This methodology complies with the International Measurement and Verification Protocol - IM&V - for calculating Energy Savings.

Tipify Views visualize the Energy Data clearly and simply. Users can see Time Series Views and adjust the time period and roll up. Views are incorporated into Reports along with Annotation and Comments and sent as PDF documents to show and explain the performance achieved.

The Tipify Energy App allows energy savings to be calulated to IM&V - International Measurement & Varification Standard -



Results of Analytics are shown as Sparks and Visualized to show frequency, duration and cost.

Analytics

- Rules and Statistical Analytics
- Extensive Rules Library
- Custom Programmable
- Clear, novel Spark Visualization

Analytics:
Discover whats really happening with your Buildings and Equipment

Analytics show problems as Sparks

The Tipify Analytics App uses a combination of Mathematical, Logical and Statistical methods for Analysis.This powerful Tool can be applied to any sort of data analysis, but for Buildings and Energy it is most commonly used for FDD - Fault Detection and Diagnosis - and Performance Analysis of Equipment.

The output of the Rules Engine are called 'Sparks' and the novel visualization shows the time, frequency and duration of the Sparks very clearly.
Using the cost function with the fault detected helps prioritize the resulting actions.

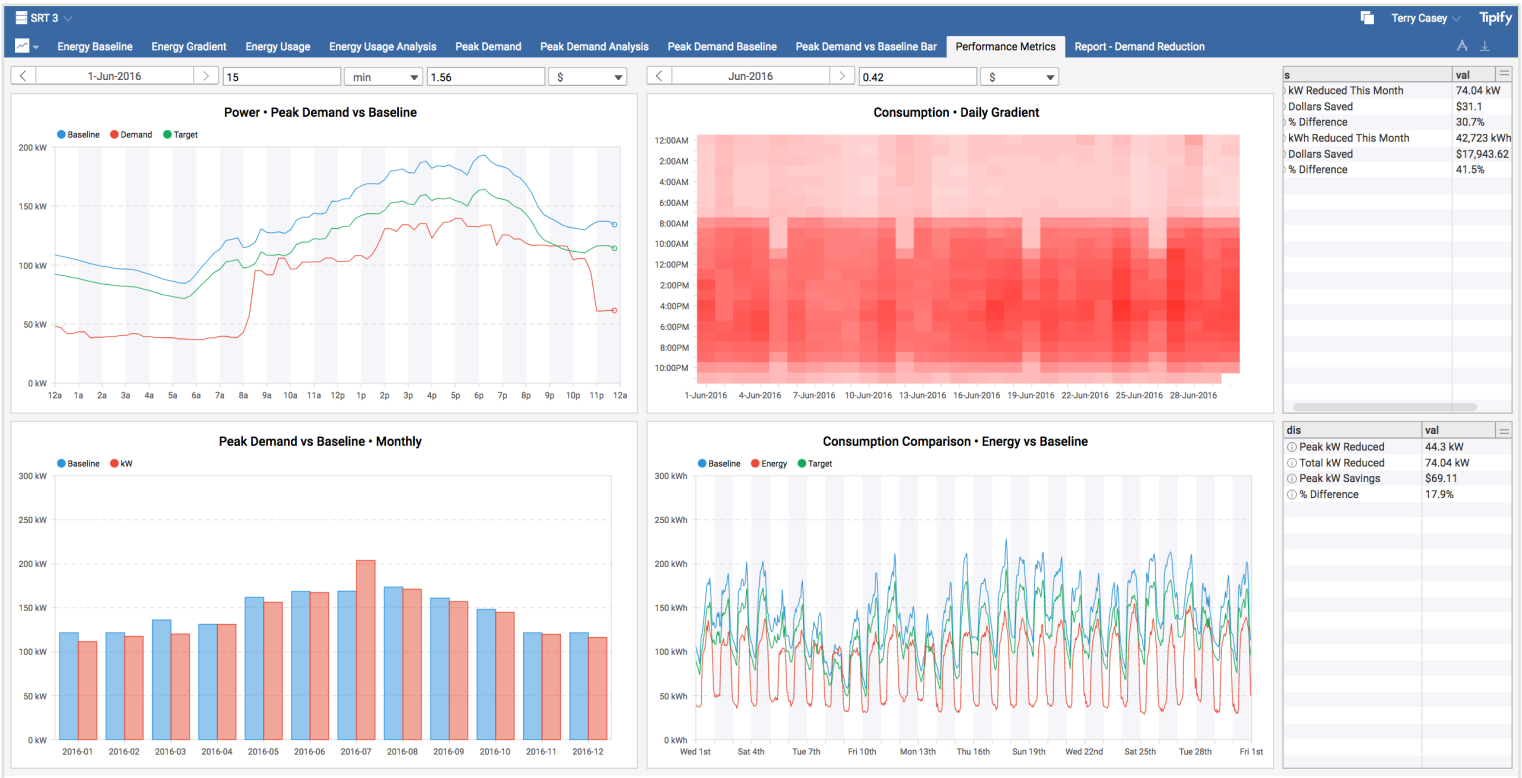
With 500 + rules and components in the Library and Custom Programming using Axon, the Tipify Scripting Language designed specifically for this purpose, these Analytics have great power and flexibility.

Equipment and system data is normally collected from the BAS and other Control and monitoring systems by the T-Stars and processed through analytics to find faults and problems.
Sparks from multiple T-Stars and Servers can be brought together and viewed in a seamless manner. All data Visualization is fully Web Based and uses HTML5 so it can be viewed directly on PC's, Laptops and Tablets directly without plug ins.

Distributed Analytics

The Rules can either be run in T-Stars or at the Central Server providing a fully distributed system with Edge Analytics – aka Fog Computing.
Edge Analytics are important as rules for equipment running under Automatic Control such as Chillers or AHU's, require high frequency data – typically every 1 minute interval – to work effectively. It is more efficient to process this High Frequency data locally and send the resulting Sparks back to the Server rather than transport, store and process all the data back at the Central Server.
Other analytics such as Energy Performance needs low frequency data, 15 mins or more is the norm, and is stored as a long term record so it's best stored and Analyzed at the Central Server.

Applications



Multiple Data Displays on single screen make Data easier to understand

Visualization

- Unique Sparks Visuals
- Line, Bar and Area Charts
- Scatter, Gradient and Pie Plots
- Composable views
- All SVG - Scales to display

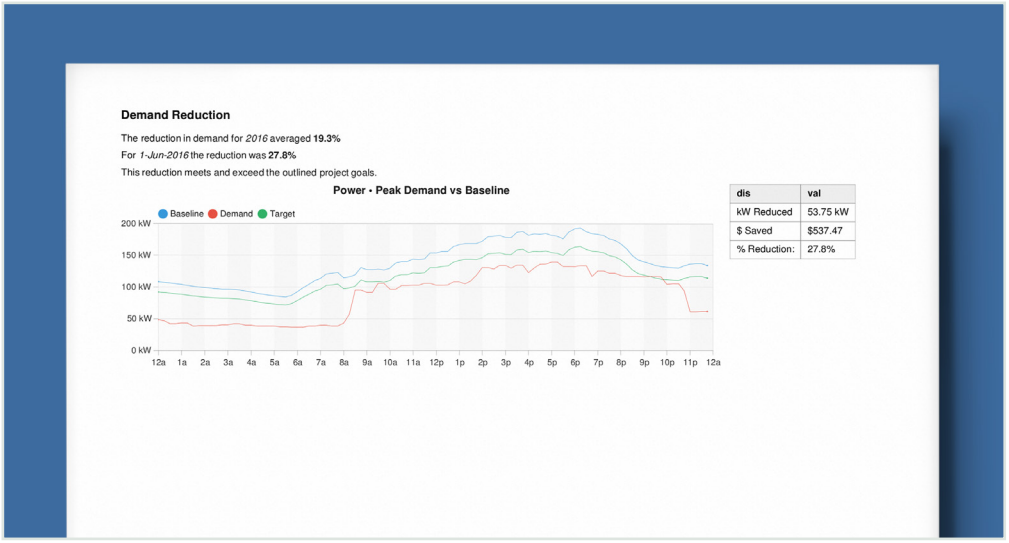
Making Data Meaningful

IoT Solutions produce a vast quantity of Data. Having ways to visualize that data so it becomes meaningful and readily understood is a challenge that Tipify handles particularly well.
Analytics results are represented uniquely as 'Sparks'. Spark Visuals show frequency and duration of events very clearly. Adding the Cost function makes it more obvious what is most important to prioritize for service action.
Time Series Data is visualized with line, bar and area graphs. Scatter Plots, Gradient and Pie Charts help making the meaning of the data clear.
Composable Views are a particularly powerful way to present data and results.
The screen can be flexibly split into the required number of panes with a different type of view or data table in each one. Users can pan and zoom the time base and change selected parameters such as unit costs and roll up periods on the Views Screen, without getting into the set up and programming behind the Views.
This feature allows users a rare level of flexible interaction with the data rather than having the usual fixed representations.
All Visuals use SVG format and are fully Web Based with HTML 5 so they fully scale to the size of the display used without any additional plug in's or downloads.

Composable views allow users a flexible interaction with their Data

Reports

- Renders Visuals as PDF's
- Add Annotation and Comments
- E-mail and Printed Reports



Screen views are combined with annotation on Reports PDF

Making Report Generation simple and straight

Complete Reporting Package

Energy Services Businesses need to produce Reports regularly for their clients to show the performance and benefits achieved.
The Tipify Reports Application makes it straightforward to incorporate a collection of Views that are in SVG format and using the WYSIWYG Editor, render them into PDF documents for e-mailing and printing.
Annotation and comments are added to provide a complete Reporting Mechanism.

Control

- Optimization
- Demand Control

Equipment View combines analogue & binary input and control output

Control Function

IoT Solutions require a variety of Control Functions to be performed using Tipify at the T-Star.

Most Buildings and equipment have existing controls fitted.

Tipify can provide additional control that works through the existing controls using the Connectors.

Optimization techniques can be applied that improve performance and efficiency by adding a layer of Supervisory Control that Optimizes the interaction of the different system elements by dynamic control of the Existing Control Setpoints.

Demand Level Control is used for Smart Grid Applications to limit or shift demand patterns to Optimize available energy and to minimize cost in variable cost applications

Solutions

Creating Value from your Data

Tipify solutions create value from your data to deliver clear commercial value typically by:

- Controlling Consumption: for example reducing energy consumption by improving energy efficiency and controlling when consumption occurs to minimize demand charges and use less energy when Time of Use TOU charges are higher.
- Reducing Operational Costs: for example by reducing the number of service visits because of predictive maintenance or avoiding multiple site visits because issues have been remotely diagnosed and the person with the right skills and parts can be the first responder.
- Improving quality and reducing downtime through predictive maintenance and 'fix first time' call outs.

Tipify Solutions provide for these specific needs through a combination of the Standard Tipify Applications and the specific Functions in the library.
Using these solutions leads to actionable results whether automatically from Control and Optimization or by initiating service visits to fix problems that the solutions have identified.

Energy Information and Management

Energy Management

- Baseline and Targeting
- M&V
  Measurement & Verification
- Compute Savings to IM&V standard
- Flexible Report Generation

Tariff Rate Engine

- Verify Utility Bills
- Budget Costs
- Compare Rate Plans

The Tipify Energy Application provides a comprehensive set of tools to manage Energy Information, compare consumption to targets, rank sites, and systems and calculate the savings achieved to the IM&V (International Measurement & Verification) standard.

The Tariff Rate Engine is used to model the different Tariffs and their Rules: Time of Day Pricing, Peak Demand Charges, slab pricing, etc – and calculate the correct costs based on measured consumption to verify bills and spot billing errors.

Cost budgeting and comparison of Rate Plans are also supported.

FDD
Fault Detection and Diagnosis

- Automated Fault Detection
- Performance Analysis
- Predictive Maintenance
- Visualization & Reporting

Tipify's Spark Analytics Function allows automated detection of fault conditions to identify equipment problems that are adversely affecting performance and efficiency of the system and which simple out of range alarms fail to recognize.
The Rules Engine uses mathematical, logical and statistical analysis to monitor plant performance and to alert when maintenance is required for performance improvement rather than because of a major failure of equipment.

DER's Distributed Energy Resources

- Micro Grid Control & Monitoring
- Solar PV Metering Monitoring
- Battery Management
- Generator and CHP Control and Monitoring

Generation and supply of Energy is changing rapidly as renewables, predominantly wind, solar, and energy storage and other local generations play an increasingly important part of the energy mix.
DER's are deployed on both the Supply Side of the Grid as part of the Utility's resources and on the Demand Side, behind the meter often as part of a micro Grid.
T-Stars with Tipify are effectively used to monitor performance, detect faults and problems and optimize time of use.

They are also used to measure and record Energy generation and consumption for use in the financial settlement process.

DSM Demand Side Management

- Capacity Market
- Energy Monitoring, Aggregation, Reporting, and Settlement
- Automated Demand Response
  - Spinning Reserves
  - Frequency Regulation
- Time of Use Pricing
- Peak Demand Management

Demand Side Management covers a range of mechanisms that reduce or shift demand in time to reduce the cost of energy.
There are a number of different approaches and programs from manual systems to fully dynamic pricing based on spot market prices, and vary in the notice period and frequency that they can be called.

Having Buildings act as responsive loads that can vary their time of use profile on demand is increasingly important as renewable energy resources, which are inherently intermittent such as Solar and Wind, become an increasing portion of the energy supply mix.

Optimization

- Optimization increases system efficiency
- T-Stars run advanced Control Algorithms for optimization
- T-Stars write dynamic setpoints into existing Control Systems

Energy Efficiency can usually be increased by deploying more sophisticated control strategies that optimize system and equipment performance and efficiency.

Some Typical Optimizations are:

- Demand based control of VAV Duct Pressure
- Dynamic Control of Chiller Temperatures based on actual loads
- Closed Loop control of Fan and Pump speed through VDF's
- Demand Based Ventilation using CO2 measurements.

T-Star Tipify Edge Devices

T-Stars have multiple types of connections and support many communication protocols

- Embedded IoT Platform
- Edge Analytics, Control and Visualization
- Integration using Open and Proprietary Protocols
- 3G or 4G Modem as Standard
- TPM (Trusted Platform Module) securely stores credentials

Much more than a Cellular Gateway, T-Stars perform Edge Analytics, Control and Visualization.

A Fully Distributed Tipify Platform

T-Stars are embedded edge devices running the Tipify software platform, providing fully distributed intelligence with local integration, analytics, control and visualization and connect to a Server with 3G/4G Cellular, Ethernet WAN or WiFi.

The T-Star 245 integrates with controls and sensors through the hardware connections: Ethernet, Serial, WiFi and Direct Inputs using Open and Proprietary Protocols including BACnet IP, Modbus, SNMP, oBiX, Haystack and ArcBeam.

The 2 pulse inputs are used for utility meter inputs and the device is ANSI C12 Certified as a Metering Device.

T-Star's Tipify Software provides Historization of Data, Analytics, Control and when required, full visualization of the data and analytics output.

Connection to the Tipify Enterprise Server can be made through Cellular, Ethernet WAN or WiFi.

WiFi can alternatively be used to connect local sensors and controls or used as an access point to provide a local interface for engineering, commissioning and visualization of the system running.

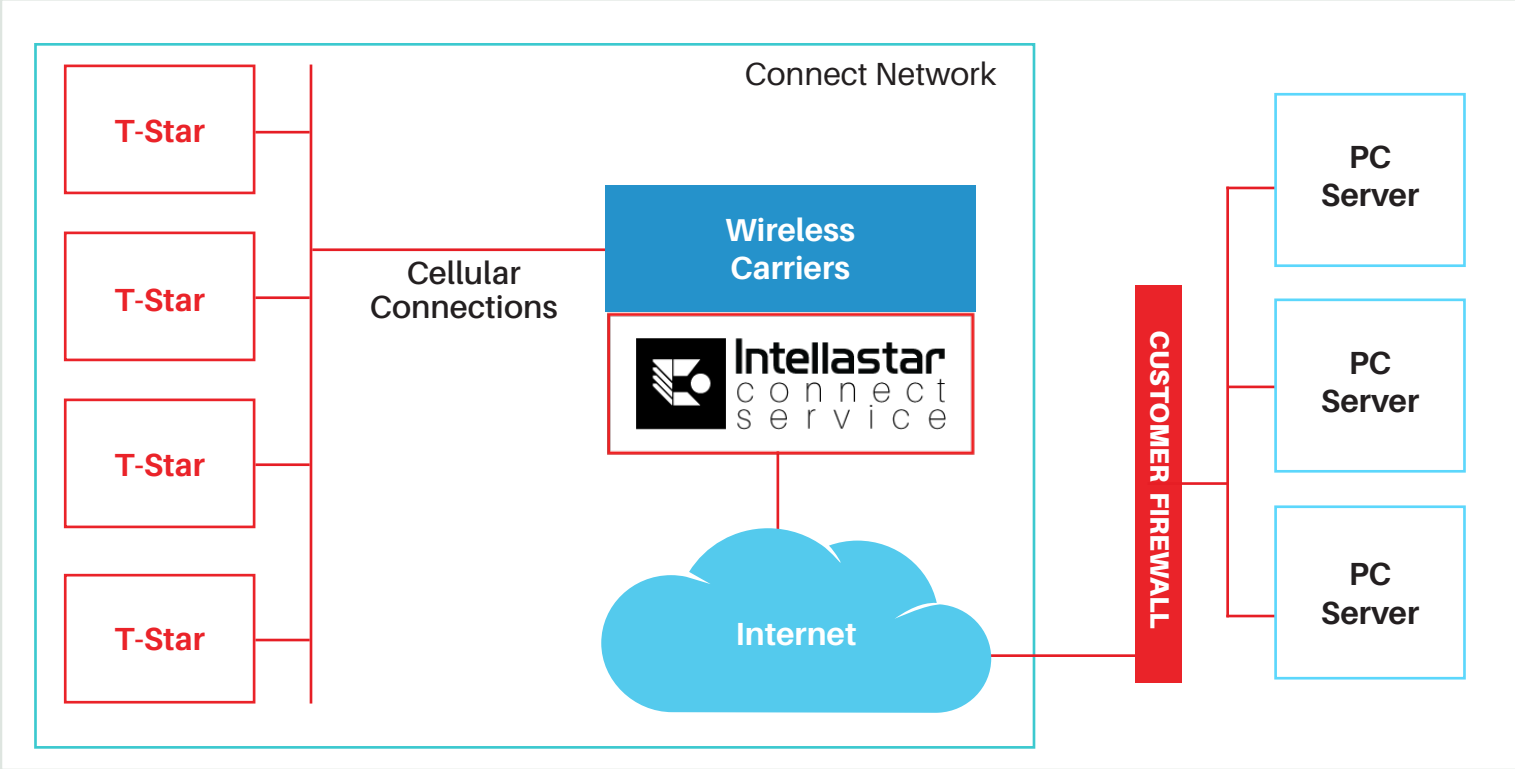
All Visualization and Tools use HTML5 and run on most browsers without additional plug in's.

T-Star's come with a cellular modem as standard – 4G Cat 1 or 3G - and can use either the Intellastar Connect Service or others as users wish.

The TPM – Trusted Platform Module – in the T-Star stores the Authentication Keys and Certificates as part of Tipify's system wide Security Architecture.

Multiple T-Star's can be connected together on Ethernet or WiFi and share a singular Modem Connection.

Connect Cellular Data Service



Intellastar Connect Data Service provides a Secure Data Connection between T-Stars and Tipify Servers

- Cellular Connection Service
- Secure Network Connection
- Individual VPN per client
- Independent of on-site IT Infrastructure
- Flexible Data Plans

A Secure High Availability Cellular Data Service.

Cellular Data Service connects T-Stars to Servers

Connect is a cellular data connection service for communication with remote devices over a private network.

It is typically used to connect T-Stars to Enterprise Servers. Connect provides a secure and reliable network for enterprise solutions that deploy and monitor remote locations or as a NOC - Network Operation Center. -

Connect is a virtual private network that is usable anywhere cellular service is available. Backed by reliable Wireless Carriers for service, access, and data transfers, the Connect Private Network serves as a WAN - Wide Area Network - in an enterprise solution.

Connect allows communication with any device at any time to retrieve data or results or write updates to the remote device and provides easy, rapid deployment and networking of devices without needing to rely on individual site IT infrastructure.

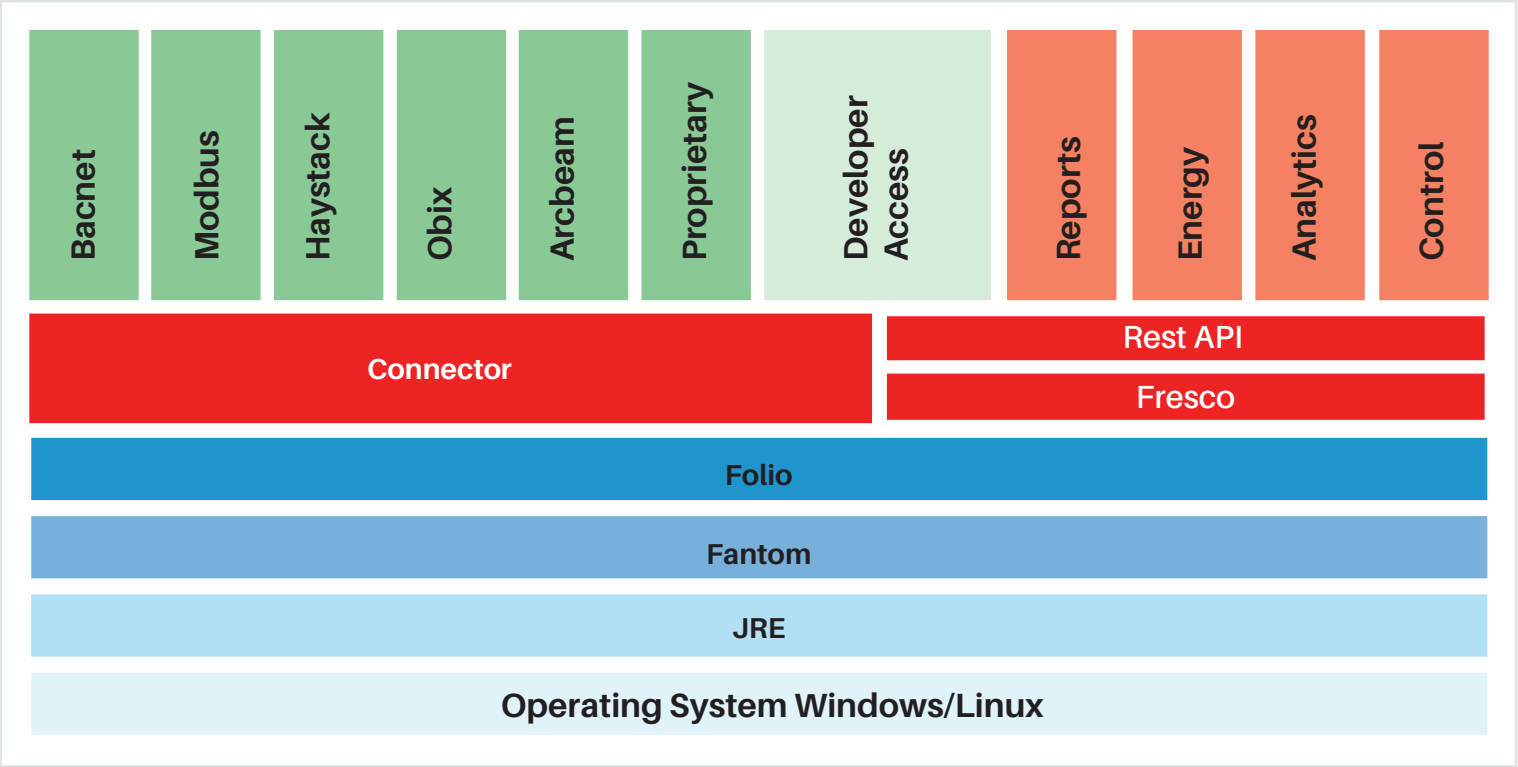
The Connect Private Network in an enterprise solution allows internal IT systems at sites to be completely isolated.

Connect is inaccessible from the public internet space. Devices using the Connect service will only communicate across a private APN with the wireless carrier partners, resulting in a controlled, secure and reliable network. The connect network is accessed via a secured VPN, using AES 256 bit encryption for protecting the data, and alleviates many of today's security threats by simply not being visible from the public internet.

T-Star's or any other 3G or 4G device may be used with a Connect Private Network. Various Data Plans are available in a variety of sizes to fit different solution needs in a cost effective manner.

Services in the US are through Verizon and AT&T. International Roaming is offered through AT&T Services

More Technical Information



Tipify Software Stack

A deeper dive into the Tipify Technology

This section looks at the underlying structure and features of Tipify to understand how it provides such a high performance, scalable, secure and manageable platform.

Folio the highly efficient and fast Database used in Tipify.

Arcbeam the communication between Tipify nodes that utilizes Web Sockets, Secure Public/Private Key Authentication and SCRAM and PBKDF2 Hash for security of user names and passwords.

Haystack Data Model and Tagging that normalizes the Semantic description of data from diverse systems so that functions of Analytics, Control and Visualization can be used and reused across different equipment, systems and projects.

Data Quality including automatic detection of missing or suspect data and the NA data type.

Fully Web Based so all visualizations by the system will render in Browsers natively without additional code or plug ins.

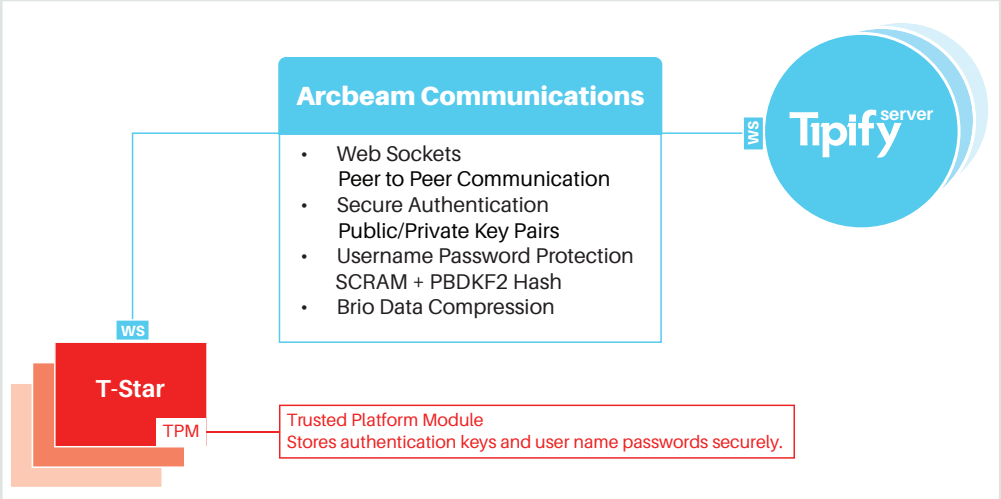
Provisioning and FOTA maintaining the Tipify Software and Solutions through upgrades and patches to add and enhance features, fix bugs and deploy security updates using the Server Provisioning Service and the FOTA
- Firmware over the Air - capability of Tipify and the T-Stars.

Licensing Model is simplified to use points only and T-Star points are licensed 'system wide' so can be archived and used at Tipify Servers without consuming further license points.

Developer Access at multiple levels:

- Axon to write custom rules and functions
- Fantom Programming to produce new Applications
- Connector Framework for further protocol development
- REST API's for connection to external packages

Arcbeam Communications



Folio Data Base

Folio Data Base technology was developed specifically for the unique needs of IoT providing a high performance Data Base ideal for performing Analytics and Data transforms on diverse sensor and equipment data.

Folio is efficient – it stores a time stamped history value in typically 12 bits - Conventional Data Base Technology including Big Data solutions take 30 to 100 bytes to store the same data, so Folio is very efficient in the size and hence cost of the Storage required. Folio is also fast – the speed of data processing comes from edge computing and 'in memory' computation where the function is run inside the database rather than transporting the data to the application. this results in much faster Data Processing.

By performing high frequency analytics at the edge in the T-Star's, rather than transporting all the data to a cloud server through a simple gateway device, network latency and data processing times can be much reduced.

Arcbeam is the peer to peer protocol used for communication between Tipify nodes and underpins the Distributed Architecture of the system. It works in tandem with existing security best practices including Firewalls, VPN's and TLS encryption. Arcbeam is layered above Websockets to establish a peer to peer communications link. Websockets is a standardized method providing full duplex communication over a single TCP connection.
Once the communications link is established the connection is fully peer to peer which means either end point can initiate the connection.

This makes it straight forward to establish a distributed architecture where T-Stars are safely hidden behind firewalls. It eliminates the complexity of traditional IoT architecture and decisions over push vs pull communication and can address concerns over requests for data coming from outside the network.
Arcbeam sits on top of established IP infrastructure of TCP, HTTP and Websockets so it works cleanly with standard security technologies including the APN's and VPN's deployed with Intellastar Connect.

Secure Authentication
Tipify uses Asymetric Cryptographic Keys; RSA 2048 bit Private/Public key pairs to authenticate each Arcbeam connection between nodes. In order for 2 Tipify nodes to establish an Arcbeam communication link, each node must be securely configured with the remote node's Public Key. This ensures a secure network connection is made only once each node verifies trust in the other end point. Security is further enhanced by the Trusted Platform Module TPM chip in every T-Star.

Protection of Passwords
User Authentication requires traditional user name password functions. Tipify utilizes a set of industry leading security technologies to manage and authenticate users and passwords.
Passwords are stored using 'PBKDF2 Hashing' which requires significant CPU cycles to compute a hash of a password, raising the difficulty of detecting the original password considerably.
Authentication of user names and passwords uses the SCRAM standard – Salted Challenge Response Authentication Mechanism – which works with PBDKF2 Hash so that neither the original password, not the PBDKF2 Hash are sent openly over the network.

Arcbeam Brio Compression
Arcbeam messages are compressed using Brio. This is the same compression technology that enables a time stamped value to be stored using 12 bits in the Folio Data Base.

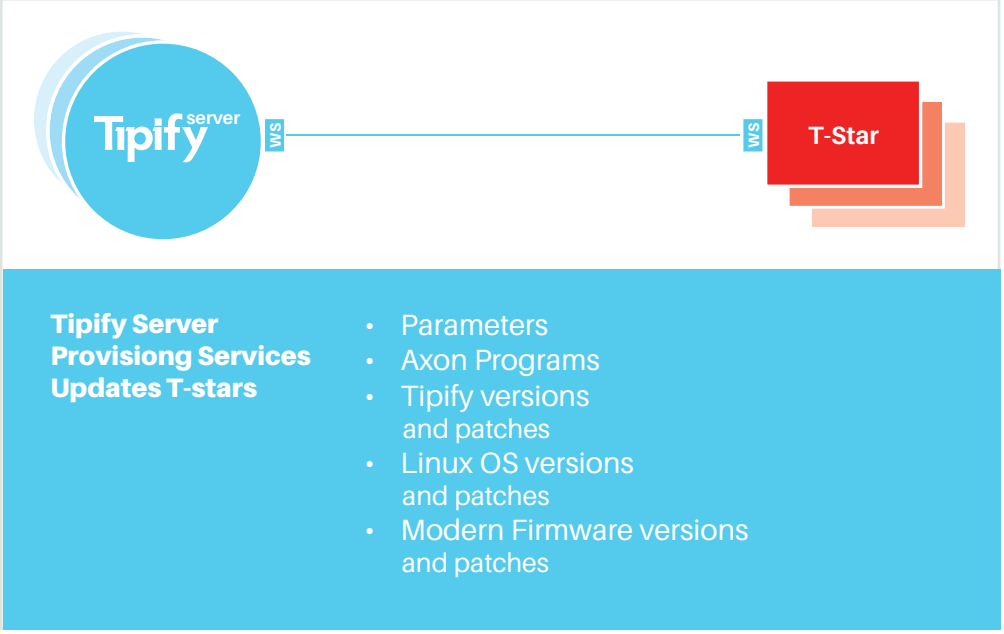
In Arcbeam, Brio compresses the entire message payload resulting in less volume of data being transmitted with lower latency, both of which are particularly important over cellular connections where bandwidth is limited and costs are based on volume of data sent.

Provisioning and FOTA

Tipify Servers can provision the software in T-Stars using FOTA - Firmware over the Air - techniques to maintain and update the installed firmware in the T-Stars.

This feature updates T-Star software with new versions and patches of Tipify, the Operating System, and Solutions for enhanced features, bug fixes, security and other patches, and any changes to the Solutions implemented in the units. This mechanism allows T-Stars to be kept up to date with latest features and security mechanisms.

These updates and changes can be orchestrated across a group of T-Stars so that many units can be updated automatically from a single command action, allowing Provisioning to be effectively and efficiently managed over large scale projects.

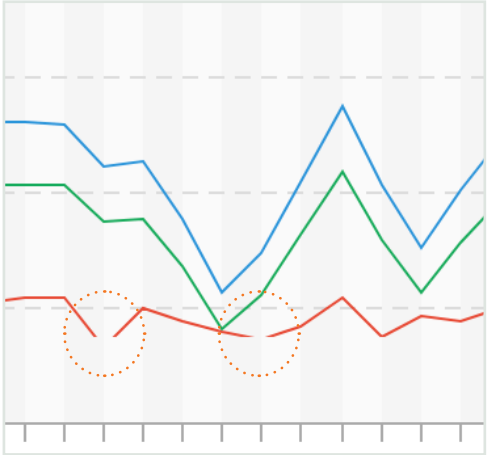


Tipify Provisioning Service

Data Quality

Data Quality is a vital part of successfully delivering value from data through analytics and optimization.
Tipify can use rules to look for missing and poor data. It can help fix bad data through interpolation and other mechanisms and keep records of any changes made to the raw data for audit and traceability.

The NA data type has been added to V3 Tipify to identify and visualize poor and missing data, and the rules that process the data to respond so that their results and conclusions remain valid.



NA Data type is used to identify missing or dubious data and excludes those readings from calculations.

```
  pt: read(unit == "kWh")
  //dduk: degreeDaysUK(dates)
  weather: read(outside and air and temp).hisRead(dates).hisRollup(max, 15min)

  linreg: baselineLinRegEnergy(2015-08-20..2015-10-01)

  map: pt.hisRead(dates).hisRollup(sum, 15min).map his => do

    dd: 0
    temp: weather.find(w => w->ts == his->ts)
    //if(temp.has("v0") )do
      //if (temp->v0 >= 66) dd = temp->v0 - 66
      //else dd = 66 - temp->v0
      dd = temp->v0 - 66

      {
        ts: his->ts,
        baseline: ((linreg->m * dd) + linreg->b).as("kWh"),
        energy: his->v0,
        target: ((linreg->m * dd) + linreg->b).as("kWh")*0.85
      }

      end
    //end
    map=  map.hisRollup(sum,rollup)
    map.addMeta({title:"Consumption Comparison \u2022 Energy vs Baseline"})
      .addColMeta("baseline", {dis:"Baseline"})
      .addColMeta("energy",   {dis:"Energy"})
      .addColMeta("target",   {dis:"Target"})

end
```

Example of Axon Script Programming

Developer Access

Developers can create new features and functions in Tipify using a number of comprehensive, well documented methods depending on the type of development required.

Axon Scripting Language is used to create rules and functions within Tipify Analytics, Data Manipulation and Data Quality processes. There is library of 500+ functions available to users but most also use Axon to create their own or modify what's provided in the library.

Tipify is provided with Applications that cover Analytics, Control, Visualization, Reporting, and developers can create their own Applications as PODs using **Fantom** language and the published API's.
www.fantom.org

Stack Hub provided a mechanism for the distribution of Applications including their Licensing and users may find third party applications available there.
https://stackhub.org

REST API's define how data is transferred to Third Party Applications that are external to the Tipify platform.

Connector Framework enables developers to create their own IP connectors to handle diverse devices and their proprietary communication protocols.

Licensing Model

Tipify takes advantage of the Distributed Architecture and Secured Connections between nodes to provide a much simplified Licensing Model that's easier to understand and apply.
In each node the only license variable is the number of data points that are recorded in the nodes data base.

Each variable can have a time stamp value reading and can be recorded as frequently and for as long as the user determines, while only consuming one license point.

Points that are licensed in T-Stars can then be archived to a Server and used in further processing without consuming a second license point in the Server. This effectively means that variables that are licensed in T-Stars have a 'system wide' license.

Of course data imported from other third party sources into the Server will consume license points in the server as will further virtual points created from rules etc if they are stored in the Server Data Base.

License points are provided in packs and users can add any number of packs to a T-Star or Server to provide the points capacity that matches their applications, and these can be readily expanded by adding further points packs as required.
T-stars have 10, 100, and 1,000 point packs availible.
Server Licenses are 1,000, 10,000 and 50,000 points.
Server Licenses differ from the T-Star licenses only in that the Server includes the Provisioning Service and the ability to Cluster Servers together to seamlessly provide scaling.

Software Maintenance

Tipify software should be updated regularly not just to get new features and for patches that fix bugs, but to also update the software including the Linux Operating System OS and the Java JRE with the latest versions and Security Features to keep the system up to date with all Security Patches available.
Upgrades of the Tipify Software Stack are free of charge for all T-Stars for the lifetime of the product, provided that the users Tipify Server Software has a current Software Maintenance Contract.
Server Software Maintenance costs 18% of the original Software cost annually and is payable after the first year of use.

Haystack Data Model

Tipify makes use of the Project Haystack tagging and data model to add the semantic descriptions to data so it has structure and context in a uniform, normalized manner.

Haystack tagging and modeling lets us understand what each piece of data means and how it fits into the overall building system. It works by creating a model of data around items of equipment and describes how these items interact in the overall building System.

With Haystack semantics the data for any building is represented in a consistent, meaningful manner that allows analytics, control and visualization functions to be directly reused across equipment, sites and projects.

Haystack Data Modeling lets us deliver and manage large projects with diverse systems and data sources.

Consider an example:

The system reads a sensor value of 77.5, but that value has no meaning unless it is qualified with units of measurement, the variable it is measuring, the equipment that it is connected to.

We create this Semantic Metadata by adding Tags to the variable.
Temperature and DegC define the units;
Tags of Air and Supply define the function
Tags of AHU tell us the type of equipment that the data point is connected to.

The AHU will use further Tags to characterize it and its interaction with the rest of the building system:
- Fresh Air make up
- Chiller1
- VT Circuit 4

and tags can be used to characterize the AHU further:
- manufacturer
- type
- supply date
- capacity
- serviced by

the Building can be characterized by its own set of Tags:
- name
- Address
- Geo Location: Lat and Long
- Size: Square feet

We can select and filter based on any tags or combination of tags.
For example to find all Chillers of a certain type that are serviced by one organization, and use that to compare chiller efficiency with those from another supplier.

Building energy can be normalized by degree days with weather data that is automatically associated with that building based on its Geolocation and compute energy consumption per square foot by dividing Totalized Energy Tag by Size Tag values.

An Analytic function created for this AHU can automatically bind itself to another similar AHU because it has the same Tag Descriptions and Variables.
The Structure of the Folio Data Base allows additional Tags to be added directly so descriptions and characteristics can be added over time.
www.project-haystack.org

Project Haystack
Associate Member