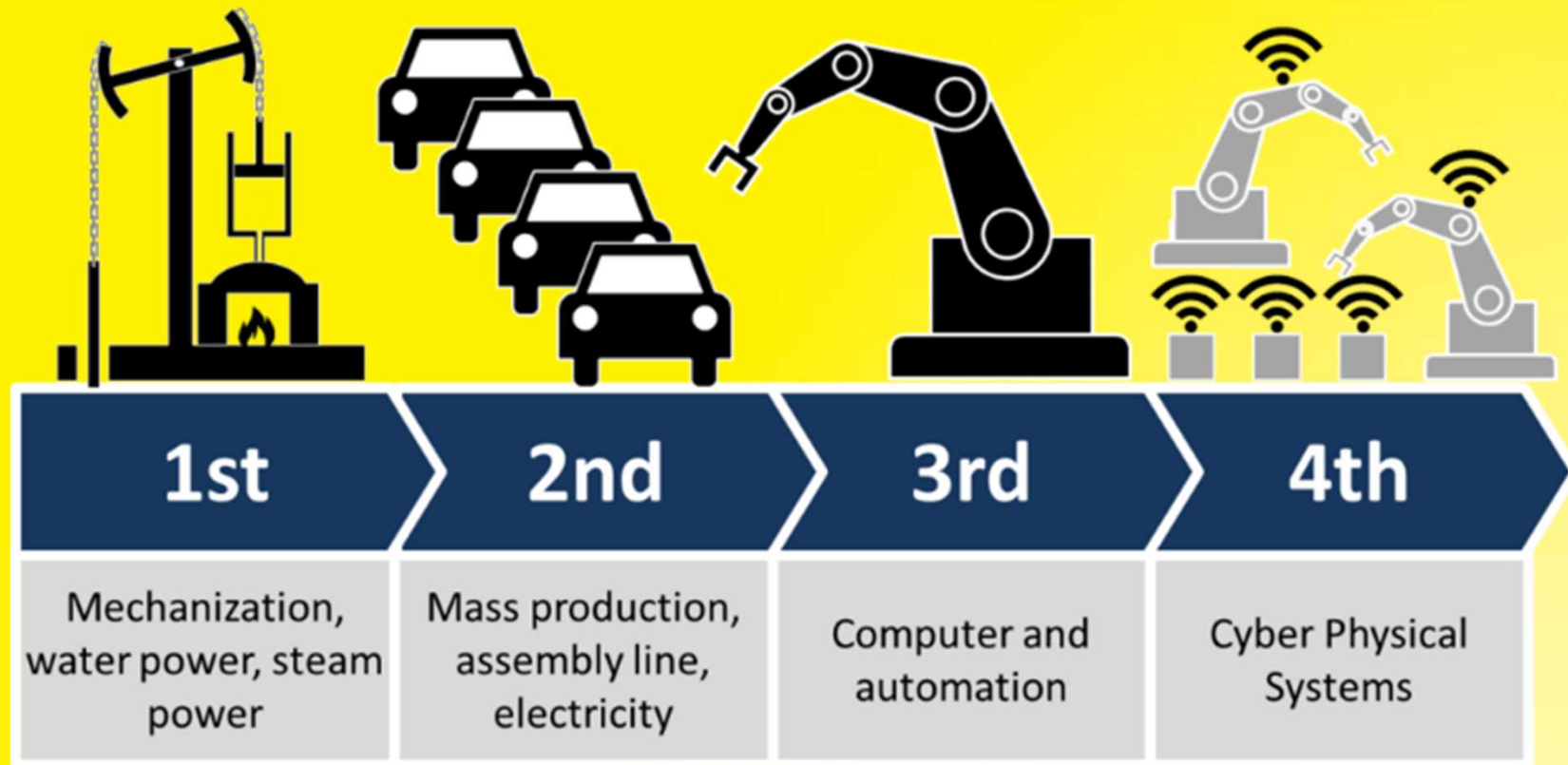




= ***Connectivity***

Industrie 4.0



Definitions of Industrie 4.0

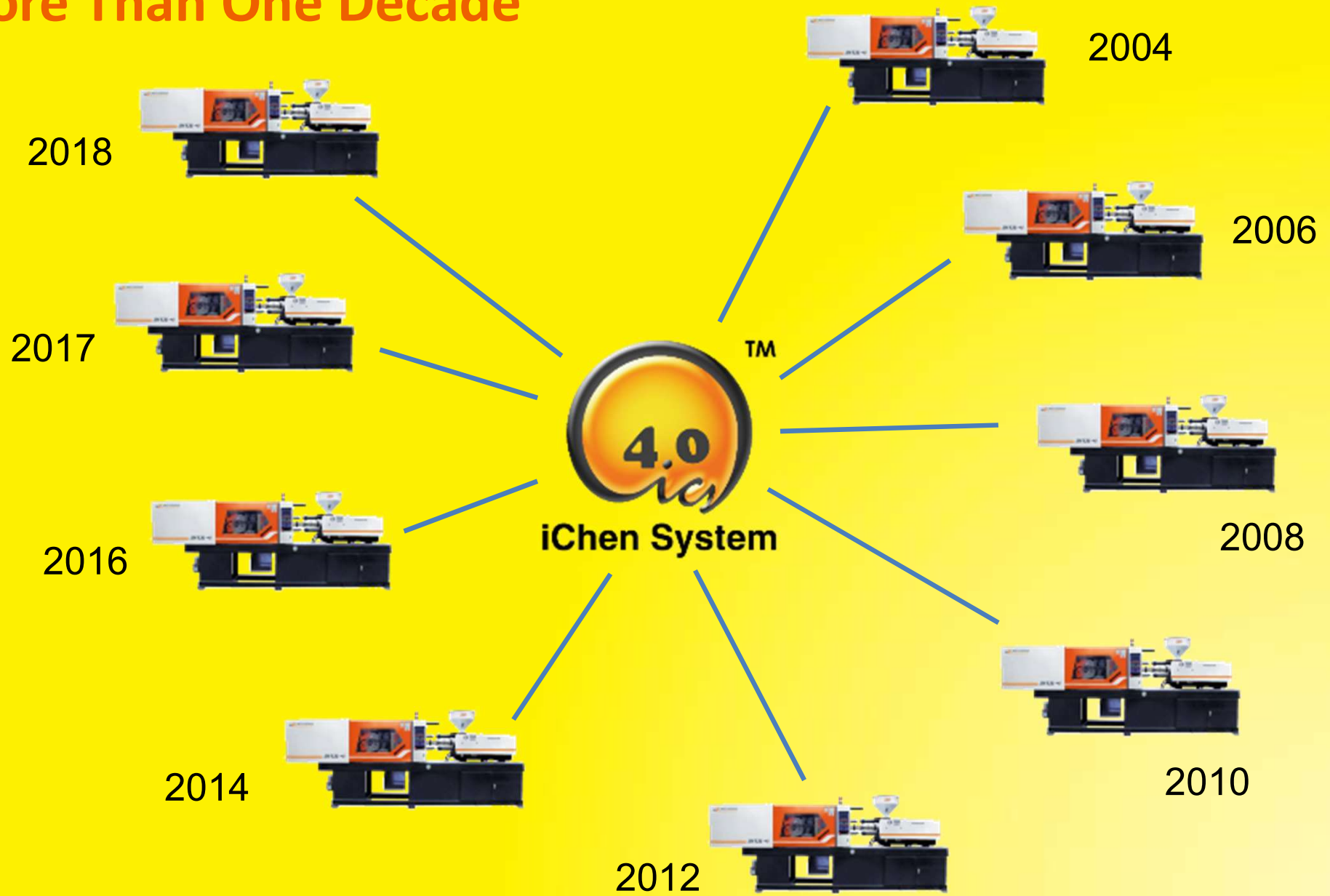
- Interoperability
- Virtualization
- Decentralization
- Real-Time
- Service Orientation
- Modularity

Source: *Design Principles for Industrie 4.0 Scenarios*, 2015, Hermann et al

No Machine Shall Be An Island



More Than One Decade



Injection molding machine



Monitoring

Data collected by
iChen[®] System:

- Machine status
- Operator info
- Cycle data
- Audit trail
- Alarms



TM

Display screen showing
iChen[®] Terminal[™]

- Display machine status
- Alarms & alerts
- Update cycle data
- Update job status
- Configurable
- Layout on floor-plan



Injection molding machine



Data Collection and Storage

Data collected by iChen[®] System:

- Machine status
- Operator info
- Cycle data
- Audit trail
- Alarms



Chen Hsong Cloud Database

- Scalable cloud storage
- Secured
- Redundant backup
- All client data isolated
- On-line reports
- Access from anywhere



Injection molding machine



Private Data Storage

Data collected by
iChen[®] System:

- Machine status
- Operator info
- Cycle data
- Audit trail
- Alarms



**Enterprise Private
Database**

- Store data locally
- Handles own security
- Mix with data from
other equipment



Injection molding machine



Managing Molds

Load Mold Settings from the iChen[®] System:

- Integrated with job cards
- Different settings for each machine
- Eliminates errors

Save Mold Settings onto the iChen[®] System:

- Separate by mold name
- Store **unlimited** number of molds
- **Multiple settings for each mold for different machines**
- Eliminates errors



iChen System

Injection molding machine



MIS/MES Integration

MIS/MES integration:

- Operator access control
- Integrated security
- Job scheduling
- Mold data settings



Open Protocol™



Client MIS/MES

Injection molding machine



Open Source

iChen[®] System manages security and controls access

Data collected by iChen[®] System:

- Machine status
- Operator info
- Cycle data
- Audit trail
- Alarms



iChen System

Open Protocol[™]

- Open and free to use
- Fully documented
- Open Source
- Code libraries and examples provided

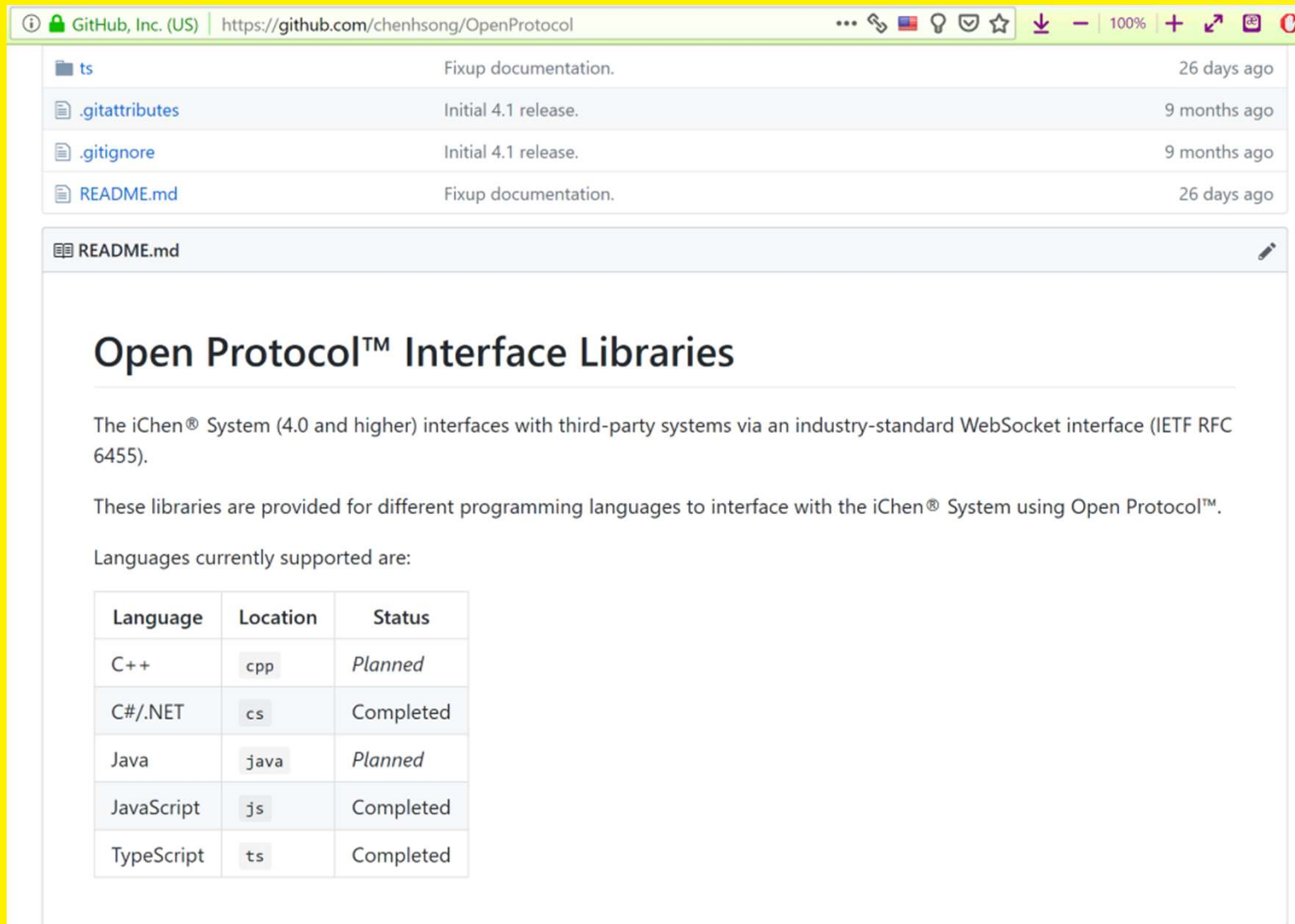


Third-Party Software

iChen[®] Distribution on GitHub

The screenshot shows the GitHub profile page for 'Chen Hsong Global Software Repository'. The profile header includes the repository name, a description 'Central repository for all Chen Hsong open-source and redistributable software.', and contact information: 'Hong Kong', 'https://chenhsong.com', and 'schung@chenhsong.com.hk'. Below the header is a navigation bar with 'Repositories 9', 'People 1', 'Teams 0', 'Projects 1', and 'Settings'. The 'Pinned repositories' section features three cards: 'iChen-Server' (iChen Server 4 Distribution (.NET Framework)), 'iChen-Server-Core' (iChen Server 4 Distribution (.NET Core)), and 'OpenProtocol' (iChen[®] System Open Protocol™ access libraries, C#). A search bar and filters for 'Type: All' and 'Language: All' are present. The repository list shows 'ichen-analytics' (Analytics (front-end) UI for the iChen[®] System, TypeScript, Updated 17 days ago), 'ichen-terminal' (Terminal (front-end) UI for the iChen[®] System, TypeScript, Updated 17 days ago), and 'ichen-server-config' (Settings/Configuration (front-end) UI for the iChen[®] System). A 'Top languages' box shows C#, TypeScript, and HTML.

iChen[®] Open Source on GitHub



The screenshot shows a GitHub repository page for 'OpenProtocol' by 'chenhsong'. The browser address bar shows 'https://github.com/chenhsong/OpenProtocol'. The repository files list includes 'ts', '.gitattributes', '.gitignore', and 'README.md'. The 'README.md' file is selected and displays the following content:

Open Protocol™ Interface Libraries

The iChen[®] System (4.0 and higher) interfaces with third-party systems via an industry-standard WebSocket interface (IETF RFC 6455).

These libraries are provided for different programming languages to interface with the iChen[®] System using Open Protocol™.

Languages currently supported are:

Language	Location	Status
C++	cpp	Planned
C#/.NET	cs	Completed
Java	java	Planned
JavaScript	js	Completed
TypeScript	ts	Completed

Full Documentation on GitHub

GitHub, Inc. (US) | <https://github.com/chensong/OpenProtocol/blob/master/cs/doc/messag>

iChen® 4.1 Open Protocol™ .NET Library Messages Reference

Copyright © Chen Hsong Holdings Ltd. All rights reserved.

.NET Framework Required: .NET Standard 1.6

For `iChen.OpenProtocol.dll` version: 4.1.1 and up

Document Version: 4.1.1

Last Edited: 2018-06-30

Introduction

The iChen® System 4.1 publishes an open communications protocol for third-party connectivity. An external system communicates with the iChen® System via industry-standard WebSocket (IETF RFC 6455) connections with text-based payloads. All messages passed in the protocol are serialized to plain-text in **JSON** format.

To assist in connectivity, an access library is provided for the Microsoft .NET Framework. The library contains types, interfaces and classes useful for constructing, serializing and parsing **JSON**-formatted messages.

[MIS/MES Communications Chart](#)

Enum Types

Assembly: `iChen.OpenProtocol.dll`

Namespace: `iChen.OpenProtocol`

Type Name	Description	Flag?
-----------	-------------	-------



OPC UA

(Unified Architecture)



What is OPC?

- **OPC Foundation** started in 1994 by major industrial players around the globe
- Specifies the OPC (OLE for Process Control) standard, which is *de facto* for communications with industrial equipment
- The original OPC standard (*OPC Classic*) – C++ and Windows®-based – started showing age in the new, Internet-connected world of today
- The OPC Foundation specified the new **OPC UA** (Unified Architecture) framework as a replacement for *OPC Classic*
- **OPC UA** will replace *OPC Classic* in the near future as the backbone of tomorrow's intelligent factories



Why OPC UA?

- **OPC UA** is...
 - platform-independent, vendor-independent
 - extensible, service-oriented
 - programming language-independent
 - built-in security features
 - integrates all functionalities of *OPC Classic*
- **OPC UA** is usually considered a cornerstone of Industrie 4.0.



Full OPC UA Support

- **OPC UA** is fully supported:
 - Data acquisition (read/write)
 - Machines and parameters exposed as standard nodes in the address space
 - Subscriptions (change notifications)
 - Alerts, Alarms and Events (A&E)
 - All common communication models
 - TCP/IP, HTTP/WS, HTTPS, etc.
 - All common security models
 - Seamlessly interoperates with all other OPC UA-enabled equipment and systems

Injection molding machine



OPC UA Support

OPC UA

- Data acquisition (read/write)
- Subscriptions (change notifications)
- Alerts, Alarms and Events (A&E)
- All common communication models
- All common security models



iChen System



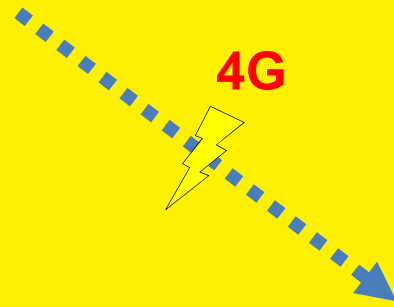
MIS/MES with OPC UA Interface

Injection molding machine

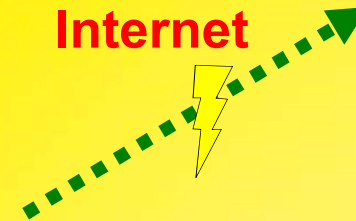


4G IOT SIMM

No Wires!



4G



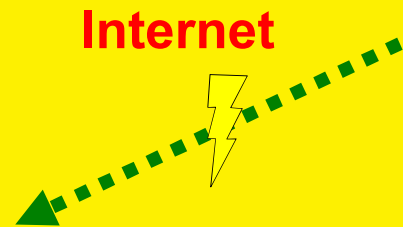
Internet



Monitoring

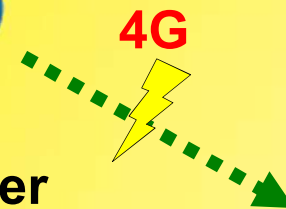


iChen[®] Cloud Server
on
Chen Hsong Cloud



Internet

Analytics



4G

Data Access



iChen[®] Cloud Server



iChen System

iChen[®] Server 4.1



En



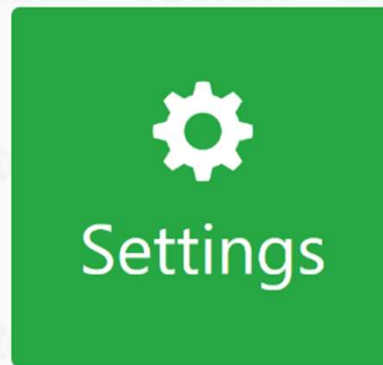
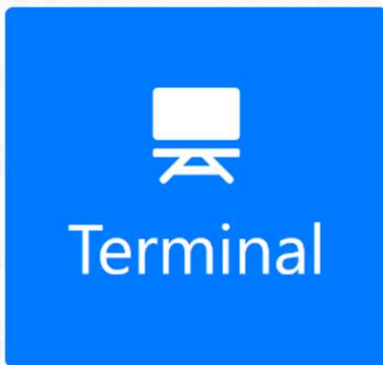
繁



简



CHEN HSONG



© 2016-2018 Chen Hsong Holdings Ltd. All rights reserved.

iChen[®] Cloud Terminal

Online

ID	Name	Status
1234321	EM120-CBm...	離線
203492	EM-Aux	離線
22306660	EM80-SVP/3+	離線
456895	EM400-SVP/...	離線
76820	JM138-Ai	離線
77834	JM168-M...	離線
Ai02inKZ	JM138-AI	離線
Ai02inKZ (O...	JM138-AI	離線
CBmold300	EM150-SVP3	離線
JohnnyAi	JM800SVP	離線
MPC7Test	JM268C1	生產
Smok...	JM13...	離線

MPC7Test JM268C1

生產

13,683

Stephen

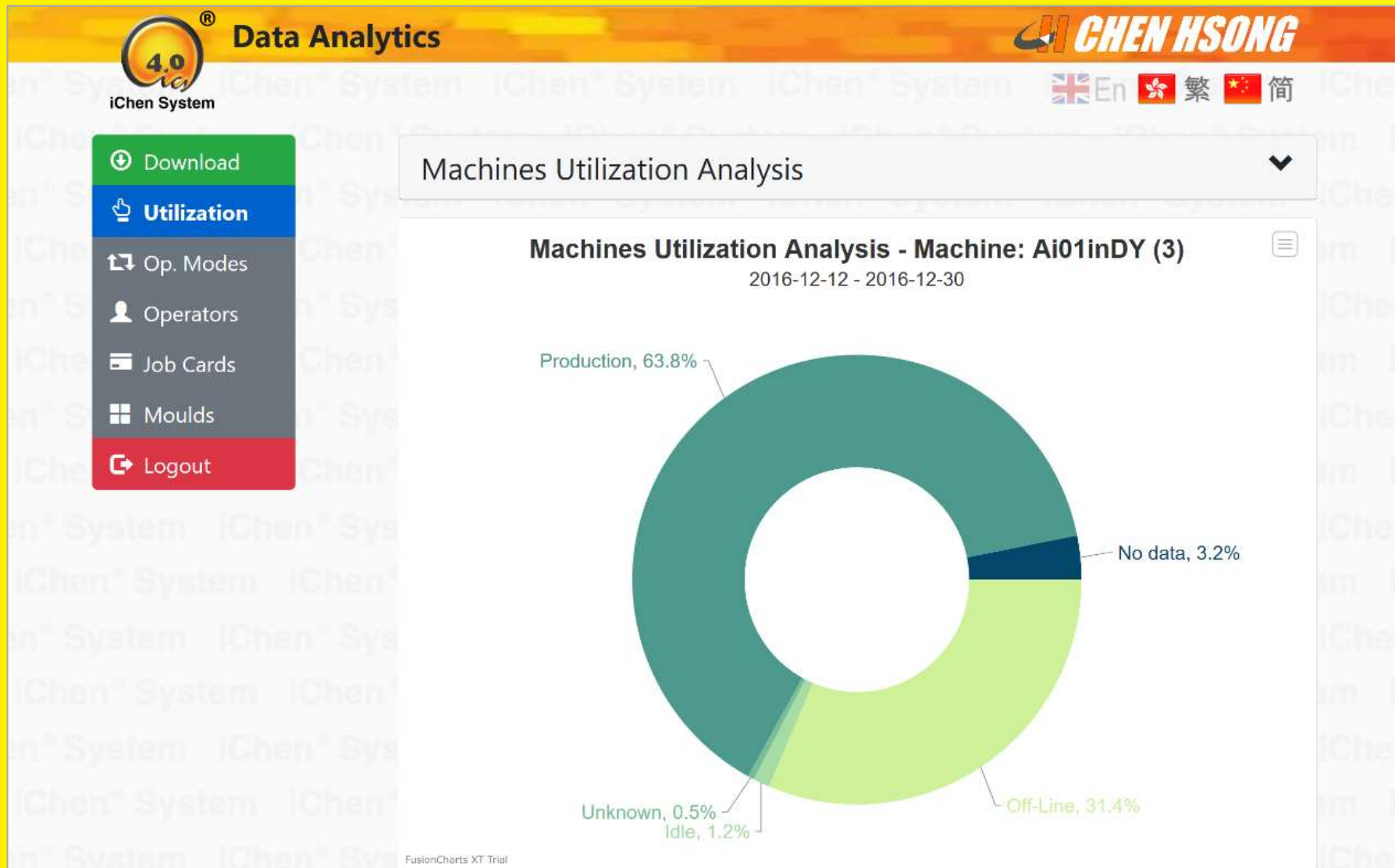
iChen[®] Cloud Analytics – Data

The screenshot displays the iChen Cloud Analytics interface. At the top left is the 'iChen System 4.0' logo. The main header reads 'Data Analytics' and 'CHEN HSONG'. Language options for English (En), Traditional Chinese (繁), and Simplified Chinese (简) are visible. A left-hand navigation menu includes: Download, Utilization, Op. Modes, Operators, Job Cards, Moulds, and Logout. The central 'Download Historical Data' dialog box is open, showing a date range of '2016-12-12 - 2016-12-30'. It includes dropdowns for 'Download Cycle Data' and 'Machine Ai01inDY (3)'. The 'File Format' dropdown is expanded, listing options: .XLS - Excel Spreadsheet, .XLSX - Excel Spreadsheet (highlighted), .CSV - Comma-Separated Text File, .CSV - Tab-Separated Text File, and .JSON - JSON File. A 'Download' button is visible. To the right, another date range '2018-10-01 - 2018-10-26' is shown with a calendar view for October 2018, where the 26th is highlighted.

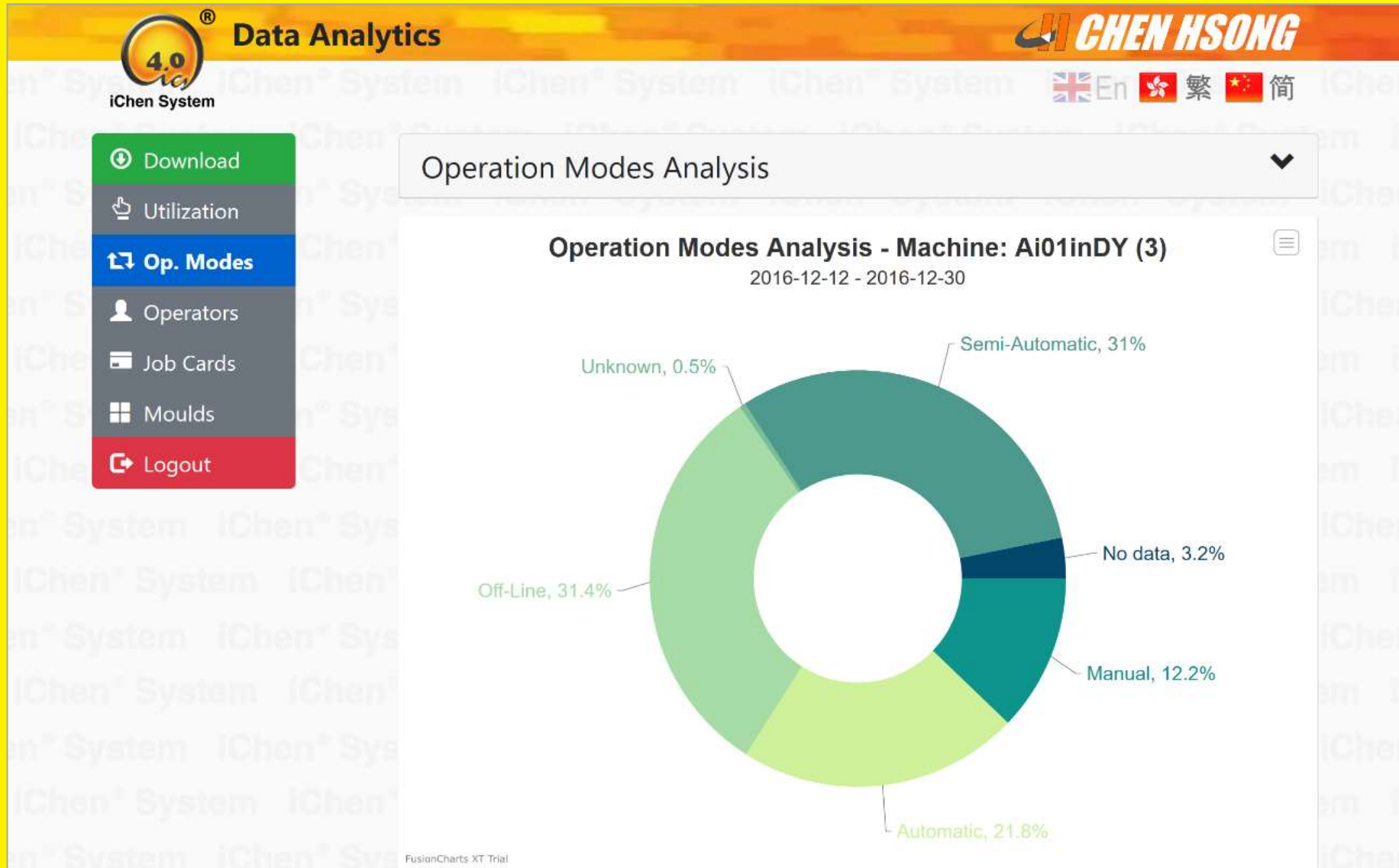
iChen[®] Cloud Analytics – Analysis

The screenshot displays the 'Machines Utilization Analysis' interface within the iChen System. The top navigation bar includes the 'Data Analytics' title and the 'CHEN HSONG' logo. Language options for English (En), Chinese (繁), and Chinese (简) are visible. A left-hand sidebar contains menu items: Download, Utilization (highlighted), Op. Modes, Operators, Job Cards, Moulds, and Logout. The main content area features a date range selector set to '2016-12-12 - 2016-12-30', a 'Categorize' dropdown menu currently showing '(None)' with a list of options including '(None)', 'By Hour', 'By Shift', 'By Day' (highlighted), 'By Week', 'By Month', 'By Quarter', and 'By HalfYear', and a 'Machine' dropdown set to 'Ai01inDY (3)'. A 'Run' button with a lightning bolt icon is positioned below the 'Categorize' dropdown.

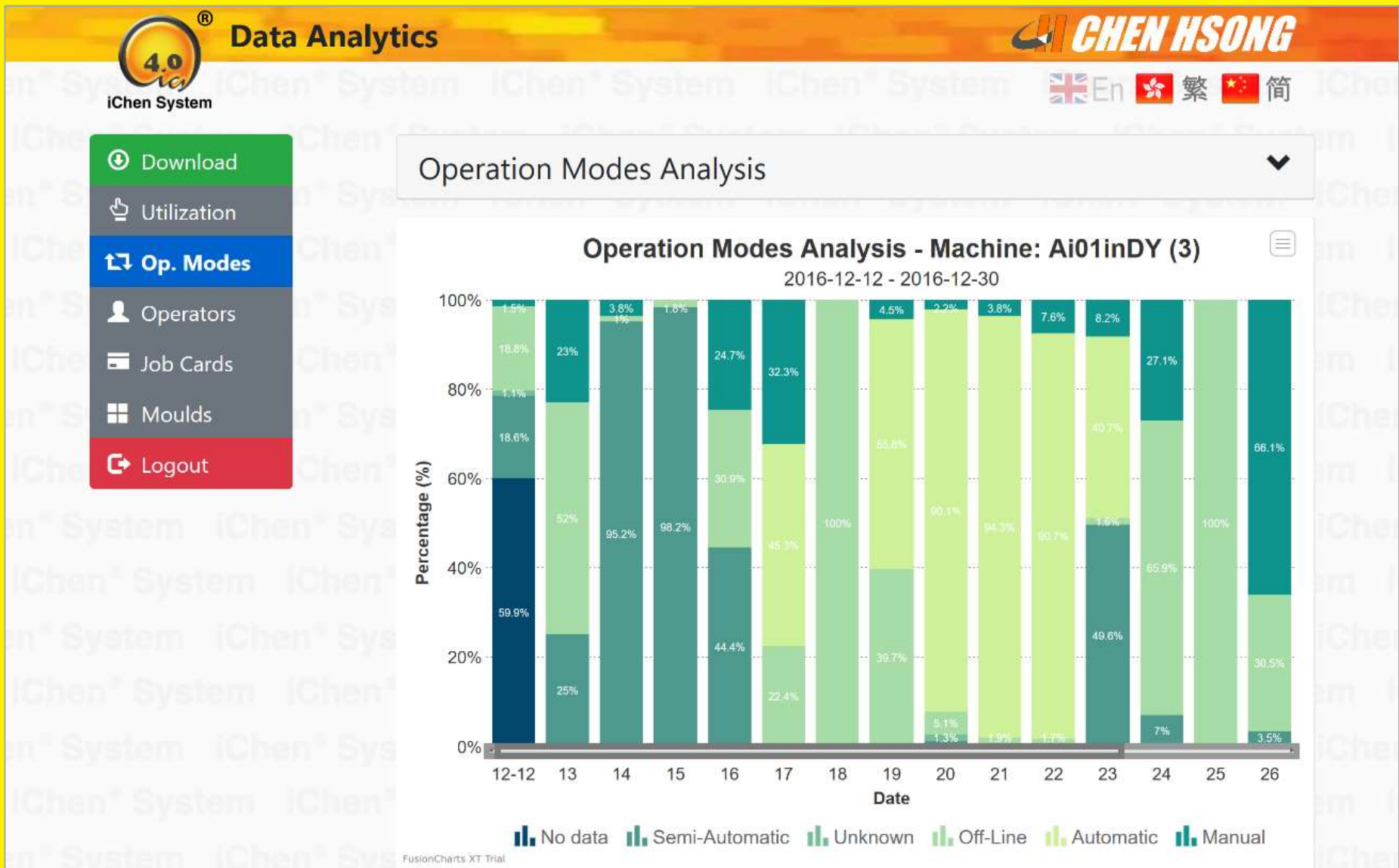
iChen[®] Cloud Analytics – Utilization



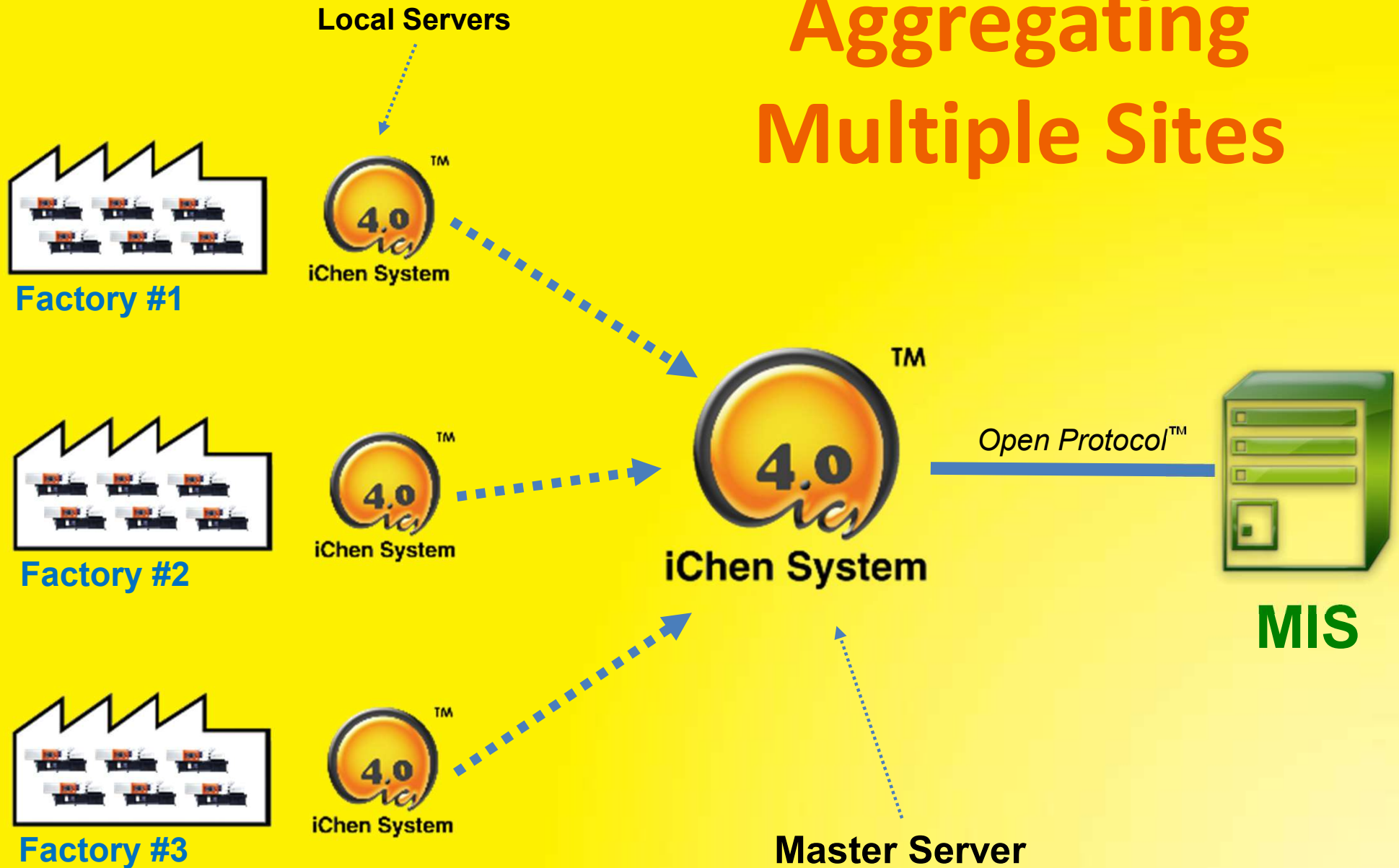
iChen[®] Cloud Analytics – Op Modes



iChen[®] Cloud Analytics – Period



Aggregating Multiple Sites



Supported Controllers

Nippobatta

- Ai-01
- Ai-11
- Ai-02
- Ai-12
- CPC-6.0
- MPC-6.0
- MPC-7

CDC

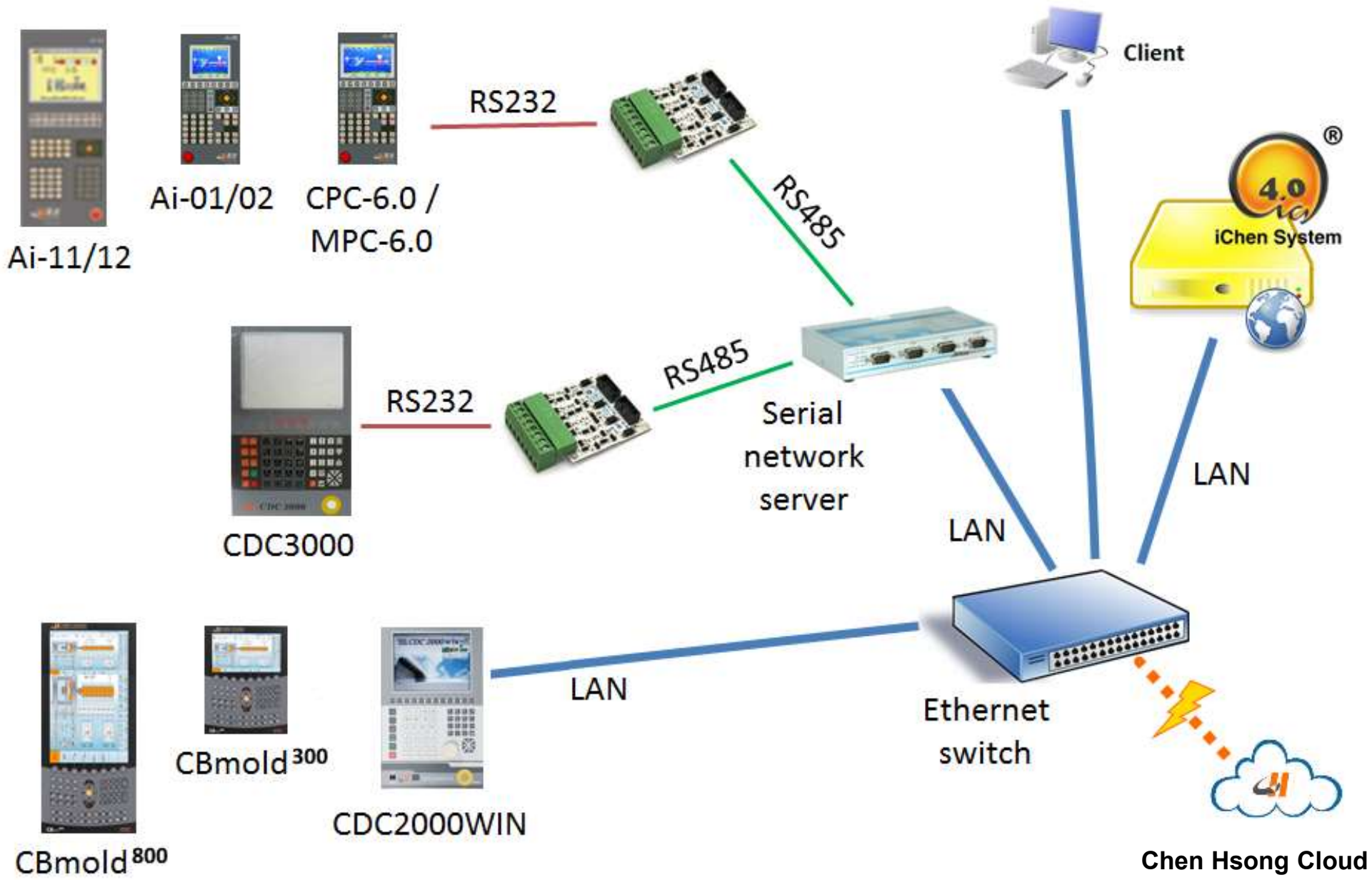
- CDC2000WIN

Beckhoff®

- CBmold³⁰⁰
- CBmold⁸⁰⁰

Others

Integrate with C++ interface library.



Types of Data Available

Machine Status

- **Operating Mode:** Manual, semi-automatic, automatic
- **Job Mode (user defined):** Active production, mold trial, samples, scheduled maintenance etc.

Operator

- Operator identity and access level

Cycle Data

- Cushion position, injection time, max. injection speed, clamp open position, cycle time, good-part count etc.

Alarms & Warnings

Audit Trail

- All setting changes on machine, with time-stamp and operator ID

MIS/MES Integration

Centralized Security

- **Lock down** all machine access with local passwords
- Centrally-administer operator accounts, passwords and individual access levels
- **Disable access** centrally as operator resigns or transferred

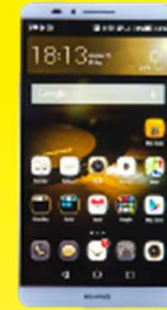
Centralized Job Scheduling

- **Schedule** production orders among machines
- Automatically load **mold settings** data
- **Restrict** workload of machine
- Automatically **stop production** when quantity reached

Cloud Data Access



**Chen Hsong
Cloud Database**



Smartphones



Tablets



Desktop PC's

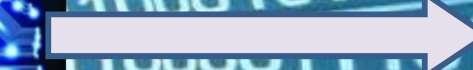
Leverage BIG DATA on the CLOUD



Chen Hsong
Cloud Database



Reports



Alerts &
Alarms



Analytics



For More Details...

cloud.chenhsong.com/iChen

