建築伝熱計算プログラム/ライブラリの公開をめぐって

第1部　国内外におけるプログラム/ライブラリの公開の実情と課題

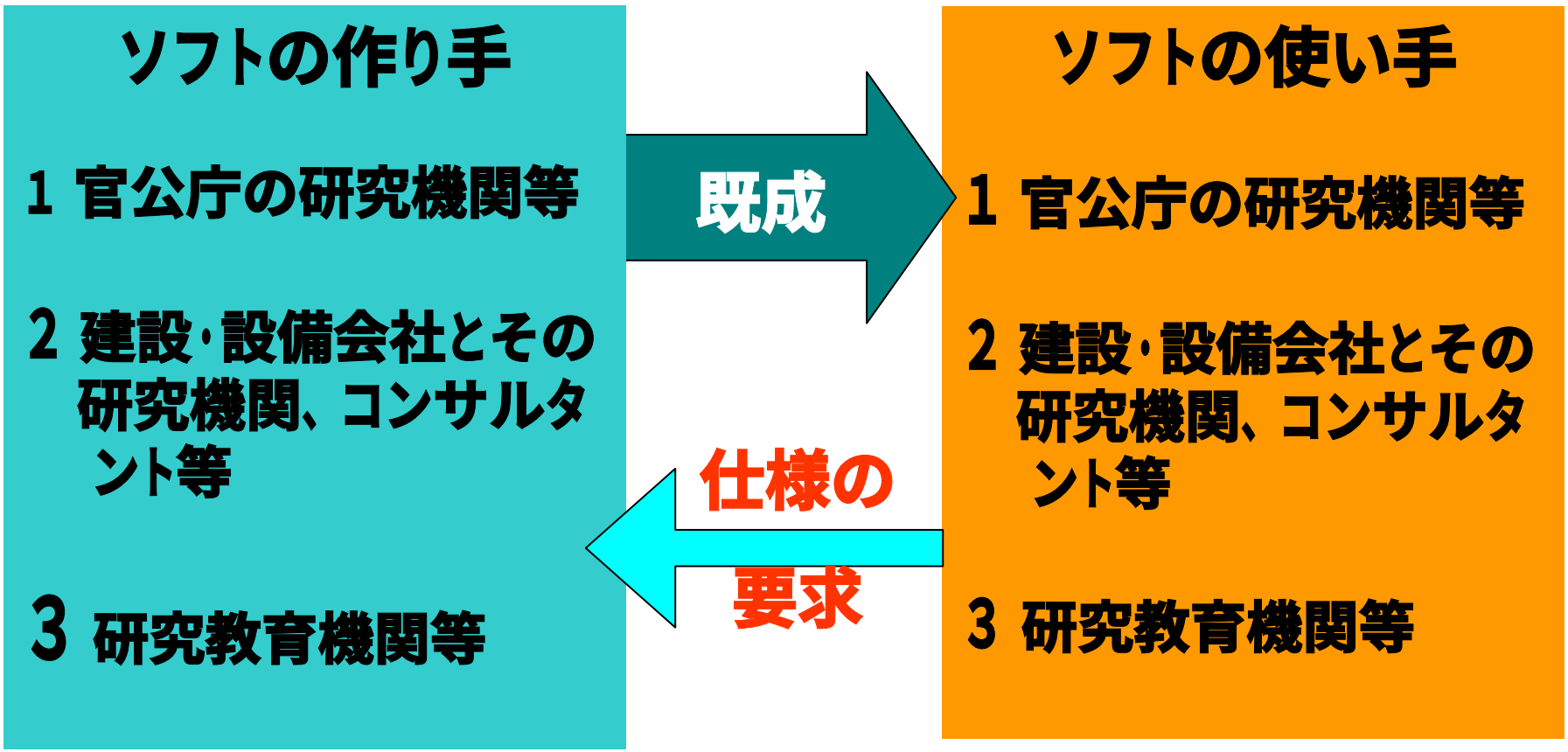
1）海外の実情（1）

宮城工業高等専門学校
内海康雄

全体の流れ

- 環境工学に関するソフトウェア
- ソフトウェアはどこにあるか？
- 誰が作り誰が何のために使うのか
- ＷＥＢの例　ＤＯＥ、ＡＳＨＲＡＥ
- ソフトウェアの分類と表記
- 例：ＢＬＡＳＴ、Ｅｎｅｒｇｙ＋、ＴＲＮＳＹＳ
- プログラム/ライブラリについて

環境工学に関するソフトウェア

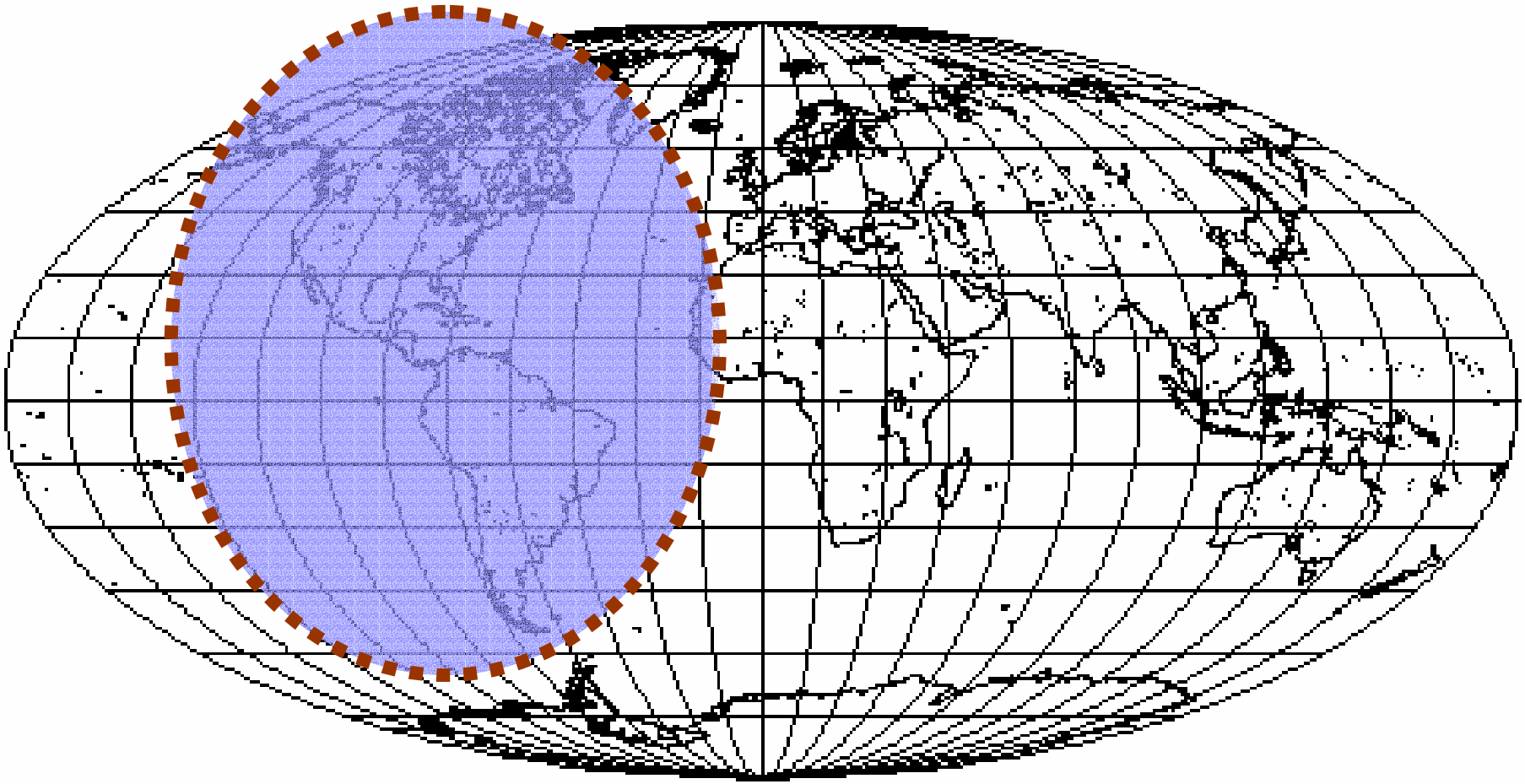


ソフトウェアはどこにあるか？

- 学会･協会
  - 学術雑誌、専門誌など
  - 学会発表、シンポジウムのデモなど
- インターネットのWEB上
  - 官公庁、学協会、教育機関自身のＨＰ
  - 商用のＨＰ

    ex．amazon.comなど
- その他

アメリカのどこに？



使う側から捜す

- 知っている人に聞く
- 書店や学協会に行く
- 自分で官公庁、商用、学協会、研究教育機関のＷＥＢを調べる

商用のＷＥＢ上　１／２

- キーワード「熱負荷」

1 

設計用最大熱負荷計算法

単行本
(1999/09) 空気調和･衛生工学会

通常4～6週間以内に発送

2 

デザイナーのための熱負荷計算チャート

松尾 陽, その他B

通常4～6週間以内に発送

商用のWEB上　2／2

- キーワード「HEAT LOAD」

1. Heat loads in British cities : report of the Heat Load Density Working Party of the Combined Heat and Power Group
2. Transient Thermal Hydraulics and Resulting Loads on Vessel and Piping Systems, 1990: Presented at the 1990 Pressure Vessels and Piping Conference, Nashville, Tennessee, June 17-21, 1990 (Pvp (Series), Vol. 190.)
3. Energy Calculations 1-Procedure for Determining Heating and Cooling Loads for Computerizing Energy Calculations: Algorithms for Building Heat Transfer Subroutines
4. 1990 ASME COGEN-TURBO : 4th International Symposium on Gas Turbines in Cogeneration, Repowering, and Peak-Load Power Generation : held in New Orleans, Louisiana, August 27-29, 1990
5. 1991 ASME COGEN-TURBO : 5th International Symposium and Exposition on Gas Turbines in Cogeneration, Repowering, and Peak-Load Power Generation, held in Budapest, Hungary, September 3-5, 1991

使う側から捜す

- ＷＥＢ上の検索
  - キーワード による検索結果の違い
  - 検索結果を読む時間がかかる
  - 環境関連のソフトウェアが少ない
  - 学協会をどのようにさがすか
    ＥＸ．ＤＯＥ、ＡＳＨＲＡＥ、ＡＳＴＭなど

→ 誰が何のために使うのか？

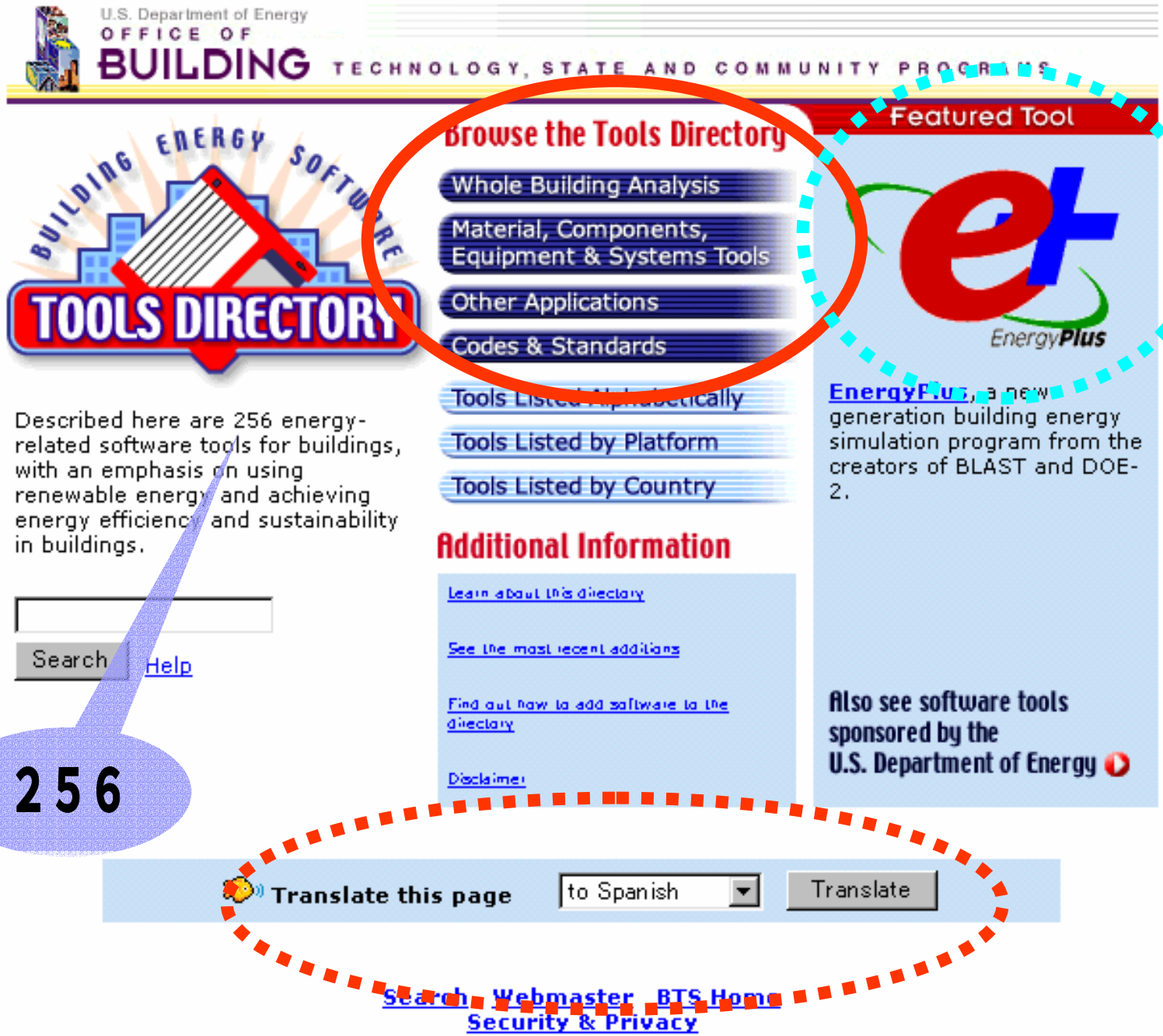
誰が作り誰が何のために使うのか

作り手	使い手		
	1 官公庁等	2 建設･設備会社等	3 学協会･研究教育機関等
1 官公庁等	行政など	設計管理など	研究教育など
2 建設･設備会社等			
3学協会･研究教育機関等			

1 官公庁 ＤＯＥ(米国エネルギー省)

- http://www.eren.doe.gov/buildings/tools_directory/
- **２５６のプログラムが登録されている**
  → 日本のプログラムは見つけられなかった

- **日本語で読める！**
- **行き着く場所を間違うとさまようことになる**
  → メールで教えてもらうのが早い


U.S. Department of Energy
OFFICE OF
BUILDING TECHNOLOGY, STATE AND COMMUNITY PROGRAMS
BUILDING ENERGY SOFTWARE
TOOLS DIRECTORY
Browse the Tools Directory
Whole Building Analysis
Material, Components, Equipment & Systems Tools
Other Applications
Codes & Standards
Tools Listed Alphabetically
Tools Listed by Platform
Tools Listed by Country
Featured Tool
EnergyPlus
EnergyPlus, a new generation building energy simulation program from the creators of BLAST and DOE-2.
Described here are 256 energy-related software tools for buildings, with an emphasis on using renewable energy and achieving energy efficiency and sustainability in buildings.
Search
Help
256
Additional Information
Learn about this directory
See the most recent additions
Find out how to add software to the directory
Disclaimer
Also see software tools sponsored by the U.S. Department of Energy
Translate this page
to Spanish
Translate
Search Webmaster BTS Home
Security & Privacy

U.S. Department of Energy
OFFICE OF
BUILDING TECHNOLOGY, STATE AND COMMUNITY PROGRAMS

BUILDING ENERGY SOFTWARE TOOLS DIRECTORY

再生可能エネルギーを使用し，建物でエネルギー効率と sustainability を達成することの重点の建物のための256 の energy-related ソフトウエアツールは，ここに記述されている。

Search 助け

Browse the Tools Directory

Additional Information

この登録簿について学びなさい

最近の付加を見なさい

登録簿へソフトウェアを加える方法を見つけなさい

放棄

Featured Tool

EnergyPlus

送風 の創作者からの EnergyPlus，新し生成の建物エネルギーシミュレーションプログラム及びDOE-2 。

Also see software tools sponsored by the U.S. Department of Energy

分　　類

- エネルギー･シミュレーション
- 負荷計算
- リニューワブル･エネルギー
- 改修のための解析
- 規格･基準
- 外壁システム

→エネルギーシミュレーションと負荷計算について主要なもの

建物全体のエネルギー･シミュレーション(1)

Tool	Applications
1D-HAM	heat, air, moisture transport, walls
ADELINE	daylighting, lighting, whole-building simulation, commercial buildings
AFT Mercury	optimization, pipe optimization, pump selection, duct design, duct sizing, chilled water systems, hot water systems
AkWarm	home energy rating systems, home energy, residential modeling, weatherization
APACHE	thermal design, thernal analysis, energy simulation, dynamic simulation, system simulation
APACHE-HVAC	buildings, HVAC, simulation, energy performance
ASEAM	energy performance, existing buildings, commercial buildings
AUDIT	operating cost, bin data, residential, commercial
BEACON	energy audit, billing analysis, equipment analysis
BLAST	energy performance, design, retrofit, research, residential and commercial buildings
BSim2000	building simulation, energy, daylight, thermal analysis, indoor climate
BuilderGuide	design, residential buildings
Building Design Advisor	design, daylighting, energy performance, prototypes, case studies, commercial buildings
Building Energy Modelling and Simulation - Self-Learning Modules	energy simulation, buildings, courseware, self-learning, modeling, simulation
BUS++	energy performance, ventilation, air flow, indoor air quality, noise level

建物全体のエネルギー･シミュレーション(2)

CELLAR	cellar, heat loss, design rules
COMFIE	energy performance, design, retrofit, residential buildings, commercial buildings, passive solar
DEROB-LTH	energy performance, heating, cooling, thermal comfort, design
DesiCalc	desiccant system, air-conditioning, system design, energy analysis, dehumidification
DOE-2	energy performance, design, retrofit, research, residential and commercial buildings
EA-QUIP	building modeling, energy savings analysis, retrofit optimization (work scope development), investment analysis
EE4 CBIP	whole building performance, building incentives
EE4 CODE	standards and codes compliance, whole building energy performance
EED	Earth energy, boreholes, ground heat storage, ground source heat pump system (GSHP)
EN4M Energy in Commercial Buildings	energy calculation, commercial buildings, bin method, economic analysis
Energy Scheming	design, residential buildings, commercial buildings, energy efficiency, load calculations
Energy-10	conceptual design, residential buildings, small commercial buildings
EnergyGauge USA	residential, energy calculations, code compliance
EnergyPlus	energy simulation, load calculation, building performance, simulation, energy performance, heat balance, mass balance

建物全体のエネルギー・シミュレーション(3)

EnergyPro	California Title 24, compliance software, energy simulation, commercial, residential
ENERPASS	energy performance, design, residential and small commercial buildings
ENER-WIN	energy performance, load calculation, energy simulation, commercial buildings, daylighting, life-cycle cost
ESP-r	energy simulation, environmental performance, commercial buildings, residential buildings, visualisation, complex buildings and systems
EZ Sim	energy accounting, utility bills, calibration, retrofit, simulation
EZDOE	energy performance, design, retrofit, research, residential and commercial buildings
FEDS	multibuilding facilities, energy simulation, retrofit opportunities, life cycle costing, emissions impacts, alternative financing
FLOVENT	airflow, heat transfer, simulation, HVAC, ventilation
FSEC 3.0	energy performance, research, advanced cooling and dehumidification
Gas Cooling Guide	gas equipment, electric equipment, cooling, chillers, air-conditioning, commercial buildings
HAP	energy performance, load calculation, energy simulation, HVAC equipment sizing
HEAT2	heat transfer, 2D, dynamic, simulation
HEED	whole building simulation, energy efficient design, climate responsive design, energy costs, indoor air temperature
Home Energy Saver	internet-based energy simulation, residential buildings
HOT2 XP	energy performance, design, residential buildings, energy simulation, passive solar
HOT2000	energy performance, design, residential buildings, energy simulation, passive solar
HOUSE	energy simulation, houses, residences, space-conditioning
IDA Indoor Climate and Energy	design, energy performance, thermal comfort, indoor air quality, commercial buildings

建物全体のエネルギー・シミュレーション(4)

LESOSAI	heating energy, energy simulation, load calculation, standards
MarketManager	building energy modeling, design, retrofit
Microflo	CFD, airflow, air quality, thermal performance
Micropas6	energy simulation, heating and cooling loads, residential buildings, code compliance, hourly
NewQUICK	Passive simulation, load calculations, natural ventilation, evaporative cooling, energy analysis.
Physibel	heat transfer, mass transfer, radiation, convection, steady-state, transient, 2-D, 3-D
PVcad	photovoltaic, facade, yield, electrical
REM/Design	energy simulation, residential buildings, code compliance, design, weatherization, equipment sizing, EPA Energy Star Home analysis
REM/Rate	home energy rating systems, residential buildings, energy simulation, code compliance, design, weatherization, EPA Energy Star Home analysis, equipment sizing
Right-Suite Residential for Windows	residential loads calculations, duct sizing, energy analysis, HVAC equipment selection, system design
RIUSKA	Energy calculation, heat loss calculation, system comparison, dimensioning, 3D-modelling
RL5M	residential, cooling, heating, energy, economic analysis.
SERIRES	design, retrofit, research, residential buildings
SIMBAD Building and HVAC Toolbox	transient simulation, integrated control, zonal models, dynamic modelling, modular, control performance, system analysis
SLAB	slab on the ground, heat loss, design rules
SMILE	object-oriented simulation environment, building and plant simulation, complex energy systems, time-continuous hybrid systems

建物全体のエネルギー・シミュレーション(5)

SOLAR-5	design, residential and small commercial buildings
SolArch	thermal performance calculation, solar architecture, residential buildings, design checklists
SPARK	object-oriented, research, complex systems, energy performance, short time-step dynamics
SUNDAY	energy performance, residential and small commercial buildings
System Analyzer	Energy analyses, load calculation, comparison of system and equipment alternatives
TAS	Building dynamic thermal simulation, building simulation , comfort, CFD, thermal analysis, energy simulation
TRACE 700	Energy performance, load calculation, HVAC equipment sizing, energy simulation, commercial buildings
TRNSYS	energy simulation, load calculation, building performance, simulation, research, energy performance, renewable energy, emerging technology
tsbi3	energy performance, design, retrofit, research, residential and commercial buildings, indoor climate
VisualDOE	energy performance, design, retrofit, research, residential and commercial buildings

DOE-HP 負荷計算のプログラム (1)

Tool	Applications
APACHE	thermal design, thernal analysis, energy simulation, dynamic simulation, system simulation
BLAST	energy performance, design, retrofit, research, residential and commercial buildings
BSim2000	building simulation, energy, daylight, thermal analysis, indoor climate
BTU Analysis Plus	HVAC, heating, cooling, heat load studies
BTU Analysis REG	HVAC, heating, cooling, heat load studies
CHVAC	commercial hvac, load calculations, CLTD
CL4M Commercial Cooling and Heating Loads	cooling loads, heating loads, commercial buildings
Cold Room Calc	refrigeration loads, heat gains, walk-in coolers/freezers sizing, refrigerated warehouses design, refrigeration equipment selection
COMFIE	energy performance, design, retrofit, residential buildings, commercial buildings, passive solar

DOE-HP 負荷計算のプログラム (2)

DUCTSIZE	duct sizing, equal friction, static regain
Energy Analysis	fans, pumps, motors, retrofit, cost-effectiveness, variable speed drive
Energy Profiler	load profiles, rate comparisons, data collection
Energy Profiler Online	online, energy usage, load profiles, bill estimation
E-Z Heatloss	heat loss, heat gain, residential calculation
EZ Sim	energy accounting, utility bills, calibration, retrofit, simulation
EZDOE	energy performance, design, retrofit, research, residential and commercial buildings
HAP System Design Load	Cooling and heating load calculation, HVAC equipment sizing, zoning and air distribution
HBLC	heating and cooling loads, heat balance, energy performance, design, retrofit, residential and commercial buildings
HVAC Checker	HVAC, heating, cooling, heat load studies
HVAC Solution	HVAC systems design, HVAC schematic design, equipment scheduling
J-Works	load calculation, commercial buildings, residential buildings
LESO-COMFORT	thermal comfort, load calculation, energy
LESOKAI	thermal tranmission, water vapor, building envelope
LESO-SHADE	shading factors, solar shading, building geometry
Load Express	Design, light commercial buildings, heating and cooling loads, HVAC
LoadCalc Plus Suite 2002	load calculation, energy cost analysis
National Energy Audit (NEAT)	retrofit, energy, audit, efficiency measures
PASSPORT	heating requirements, passive solar, residential buildings, standards

DOE-HP 負荷計算のプログラム (3)

RadTherm	convection, conduction, radiation, weather, solar, transient
RHVAC	residential HVAC, residential load calculations, ACCA, Manual J
RIUSKA	Energy calculation, heat loss calculation, system comparison, dimensioning, 3D-modelling
RL5M	residential, cooling, heating, energy, economic analysis.
SolDesigner	design, solar thermal, solar hot water, solar heating plants, solar design
Toolkit for Building Load Calculations	building loads, energy calculations, heat balance model, heat transfer
TRACE Load 700	Heating and cooling load calculation, air distribution simulation, HVAC equipment sizing, commercial buildings
tsbi3	energy performance, design, retrofit, research, residential and commercial buildings, indoor climate
UMIDUS	moisture calculation, latent and sensible conduction loads, heat and mass transfer through building envelopes
Visualize-IT Energy Information and Analysis Tool	energy analysis, rate comparison, load profiles, interval data

負荷計算のうちエネルギー･シミュレーションにも登録されているプログラム

APACHE-HVAC BLAST BSim2000
DOE-2 Energy Scheming
EnergyPlus EnergyPro ENER-WIN
ESP-r HAP HEED
HOT2000 HOUSE IDA Indoor Climate and Energy LESOCOOL
LESOSAI MarketManager Micropas6
Physibel REM/Design REM/Rate
SMILE SMOG Solacalc
SOLAR-5 SPARK
System Analyzer VisualDOE

ソフトウェアの表記　1／2

- 操作画面などの画像　　インターフェース
- 説　　明
- 必要な知識　　使い手による
- 検　　証　　確かさとは何か
- 現ユーザー数　　機関数、人数
- 対象ユーザー
- 入力データ　　入手のしやすさ
- 出力データ　　プレゼンのレベル

ソフトウェアの表記　2／2

- 計算環境　　初期経費
- プログラミング言語　　コーディング必要?
- キーワード
- 特　　長
- 短　　所
- 連　絡　先
- 入手しやすさ　　無料ダウンロード？
- 開　発　国　　日本のものがない

ソフトウェアの表記　参考

- ソフト名
- 主目的　・容量計算
- 年間計算　・時間ステップ
- 動的要素
- 計算法　時間変化の解法、システムの解法、
  流量・温度の分離、圧力・流量計算
- 対応システム・評価項目
  - 建　物　負荷計算、温熱感評価、多数室計算、換気計算、床暖房
  - 蓄熱槽　水蓄熱槽、氷蓄熱槽、氷ビルマル
  - ｺｰｼﾞｪﾈﾚｰｼｮﾝ
- ソースコードの公開　・改変の容易さ

BLAST

- Performs hourly simulations of buildings, air handling systems, and central plant equipment in order to provide mechanical, energy and architectural engineers with accurate estimates of a building's energy needs. The zone models of BLAST (Building Loads Analysis and System Thermodynamics), which are based on the fundamental heat balance method, are the industry standard for heating and cooling load calculations. BLAST output may be utilized in conjunction with the LCCID (Life Cycle Cost in Design) program to perform an economic analysis of the building/system/plant design.

- **Keywords:** energy performance, design, retrofit, research, residential and commercial buildings
- **Expertise Required:** High level of computer literacy not required; engineering background helpful for analysis of air handling systems.
- **Users:** Over 500.
- **Audience:** Mechanical, energy, and architectural engineers working for architect/engineer firms, consulting firms, utilities, federal agencies, research universities, and research laboratories.
- **Input:** Building geometry, thermal characteristics, internal loads and schedules, heating and cooling equipment and system characteristics. Readable, structured input file may be generated by HBLC (Windows) or the BTEXT program.

- **Output:** More than 50 user-selected, formatted reports printed directly by BLAST; also the REPORT WRITER program can generate tables or spreadsheet-ready files for over one hundred BLAST variables.
- **Computer Platform:** PC-compatible, 386 or higher; HP/Apollo. Source code is available and has been successfully compiled on most UNIX workstations.
- **Programming Language:** FORTRAN
- **Strengths:** PC Format has Windows interface as well as structured text interface; detailed heat balance algorithms allow for analysis of thermal comfort, passive solar structures, high and low intensity radiant heat, moisture, and variable heat transfer coefficients -- none of which can be analyzed in programs with less rigorous zone models.

- **Weaknesses:** High level of expertise required to develop custom system and plant models.
- **Contact**: Building Systems Laboratory
  University of Illinois 1206 West Green Street Urbana, Illinois 61801 USA
  telephone(217) 333-3977 facsimile(217) 244-6534
  e-mailsupport@blast.bso.uiuc.edu
  webhttp://www.bso.uiuc.edu
- **Availability:** Software prices range from $450 for an upgrade package to $1500 for new installations. This package contains complete source, almost 400 weather files, numerous documents about using BLAST as well as documentation (all on CD ROM). Contact the Building Systems Laboratory for additional information.

Energy+

- A new generation building energy simulation program that builds on the most popular features and capabilities of BLAST and DOE-2. EnergyPlus will include innovative simulation capabilities including time steps of less than an hour, modular systems simulation modules that are integrated with a heat balance-based zone simulation, and input and output data structures tailored to facilitate third party interface development. Other planned simulation capabilities include solar thermal, multizone airflow, and electric power simulation including photovoltaic systems and fuel cells.

- **Keywords:** energy simulation, load calculation, building performance, simulation, energy performance, heat balance, mass balance
- **Expertise Required:** High level of computer literacy not required; engineering background helpful for analysis portions.
- **Users:** Over 5000.
- **Audience:** Mechanical, energy, and architectural engineers working for architect/engineer firms, consulting firms, utilities, federal agencies, research universities, and research laboratories.
- **Input:** Basic EnergyPlus program (current release is Beta 4 of 5 betas) will have a simple ASCII input file. It is envisioned that private developers will wish to develop more targeted / domain specific user interfaces.
- **Output:** Basic EnergyPlus program will have several simple ASCII output files - readily adapted into spreadsheet form for further analysis.
- **Computer Platform:** Emphasis on platform portability. Windows 9x/NT/2000 executable will be available. Has been successfully compiled on UNIX and Linux platforms.

- **Programming Language:** Fortran 90
- **Strengths:** Accurate, detailed simulation capabilities through complex modeling capabilities. Input is geared to the 'object' model way of thinking. Successful interfacing using IFC standard architectural model has been demonstrated. Extensive testing (comparing to available test suites) is being done during development and results will be available.
- **Weaknesses:** Difficult to use without graphical interfaces.
- **Validation/Testing:** EnergyPlus has been tested against the IEA BESTest building load and HVAC tests. Results are available under Testing and Validation on the EnergyPlus web site.
- **Contact**:Dru Crawley U S Department of Energy EE-41 1000 Independence Avenue, SW Washington, DC 20585-0121 USAtelephone+1 (202) 586-2344 facsimile+1 (202) 586-5557e-mailDrury.Crawley@ee.doe.gov webhttp://www.eren.doe.gov/buildings/energy_tools/energyplus
- **Availability**: EnergyPlus Version 1.0 is currently available for download from the Web site. Information on licensing is also available on the Web site.

TRNSYS with IISiBat

- An energy simulation program whose modular system approach makes it one of the most flexible tools available. TRNSYS (TRaNsient SYstem Simulation Program) includes a graphical interface, a simulation engine, and a library of components that range from various building models to standard HVAC equipment to renewable energy and emerging technologies. TRNSYS also includes a method for creating new components that do not exist in the standard package. This simulation package has been used for more than 25 years for HVAC analysis and sizing, multizone airflow analyses, electric power simulation, solar design, building thermal performance, analysis of control schemes, etc.
- *See example screen images*

- **Keywords:** energy simulation, load calculation, building performance, simulation, research, energy performance, renewable energy, emerging technology
- **Expertise Required:** None to use standard package; FORTRAN knowledge helpful for developing new components.
- **Users:** Over 500.
- **Audience:** Engineers, researchers, consulting firms, architects.
- **Input:** The TRNSYS input file, including building input description, characteristics of system components and manner in which components are interconnected, and separate weather data (supplied with program) are all ASCII files. All input files can be generated by using a graphical user interface.
- **Output:** Basic output format is ASCII. The data included in those files can be life cycle costs; monthly summaries; annual results; histograms; plotting of desired variables (by time unit). It is also possible toplot variables online (as the simulation progresses).
- **Computer Platform:** Windows 95 or higher (98, NT, 2000, ME etc.) for TRNSYS interface programs. (Distributed source code will compile and run on any Fortran platform).
- **Programming Language:** FORTRAN (although unnecessary for the use of standard components).
- **Strengths:** Due to its modular approach, TRNSYS is extremely flexible for modeling a variety of energy systems in differing levels of complexity. Supplied source code and documentation provide an easy method for users to modify or add components not in the standard library; extensive documentation on component routines, including explanation, background, typical uses and governing equations; supplied time step, starting and stopping times allowing choice of modeling periods. Version 14.2 moved all the TRNSYS utility programs to the MS Windows

platform (9x/NT/2000/ME), including a choice of graphical drag-and-drop programs for creating input files, a utility for easily creating a building input file, and a program for building TRNSYS-based applications for distribution to non-users. Web-based library of additional components and frequent downloadable updates are also available to users. Extensive libraries of non standard components for TRNSYS are available commercially from TRNSYS distributors. TRNSYS also interfaces with various other simulation packages such as GenOpt for doing system optimization studies and SimCad whose CAD representation of buildings can be read directly into TRNSYS as the basis of a thermal model.

- **Weaknesses:** No assumptions about the building or system are made (although default information is provided) so the user must have detailed information about the building and system and enter this information into the TRNSYS interface.
- **Contact:**TRNSYS Coordinator Solar Energy Laboratory University of Wisconsin 1500 Johnson Drive Madison, Wisconsin 53706 USAtelephone(608) 263-1589 facsimile(608) 262-8464e-mailtrnsys@sel.me.wisc.edu，webhttp://sel.me.wisc.edu/trnsys/downloads/download.htm
- **Availability:** Version 15, Commercial -- $4000, Educational -- $2000. Free demonstration CD and information available from technical contact. International distributors are located in Germany, France, Belgium, Spain, Japan and Sweden in addition to two distributors in the US.

利用できるライブラリ

- コンポーネント(ライブラリ)のタイプ
  - ユーティリティコンポーネント
    - ex: データリーダー、プリンター、プロッター
  - 設備コンポーネント
    - ex: チラー、太陽熱集熱器、ポンプ、ファン
  - 物理現象コンポーネント
    - ex: 日射計算、蒸気の物性

標準コンポーネント(1)

- ***ユーティリティコンポーネント***
  - データリーダー
  - 時間依存の関数
  - 積算器
  - 負荷プロフィールのシークエンサー
  - 収束の制御
  - 周期的積分器
  - 単位変換ルーチン
  - 外部DLLの呼出し
  - EESルーチンの呼出し
  - パラメータの置換え
  - 入力値の再呼出し
  - 休日計算機
  - スケジュール設定
- ***蓄熱***
  - 成層流体タンク
  - ロック・ベッド
  - プラグ流れタンク
  - 可変容積タンク
  - 詳細型成層流体タンク
- *HVAC**機器***
  - ON/OFF 補助熱源
  - 吸収式冷凍機
  - Dual-Sourceヒートポンプ
  - 冷却コイル
  - 空調機
  - 冷却塔
  - 圧縮式冷凍機
  - ON/OFF 補助冷熱源

標準コンポーネント(2)

- ***建物の負荷と構造***
  - エネルギー/(度日) 住宅
  - 詳細単室
  - 詳細多数室
  - 屋根と小屋裏
  - オーバーハングと袖壁
  - 窓
  - 蓄熱壁
  - サンスペース
  - 容量を集中させた建物
- ***熱交換器***
  - 熱交換器
  - 廃熱回収
  - 一定効率 HX
- ***流体関連機器***
  - ポンプ
  - ファン
  - ミキシングバルブ
  - 膨張弁
  - 減圧弁
  - パイプ／ダクト
- ***制御機器***
  - ON/OFF 微分型制御機器
  - 3 段階室内サーモスタット
  - マイクロプロセッサ･制御機器

標準コンポーネント (3)

- *電気コンポーネント*
  - バッテリー
  - レギュレーター/インバータ
  - PV/熱 コレクタ
  - 風力発電機
  - 詳細光発電機器
- *出力コンポーネント*
  - プリンター
  - プロッター
  - ヒストグラム・プロッター
  - シミュレーションのまとめ
  - コスト分析
  - オンライン・プリンター
- *太陽集熱器*
  - 平板型集熱機器
  - 蓄熱器付き熱サイフォン集熱器
  - 真空チューブ
  - 性能図
  - 理論的平板
  - CPC 集熱器
- *物理現象*
  - 日射計算機
  - 集熱器の日射遮蔽
  - 太陽位置
  - 気象データ発生器
  - 冷媒の物性
  - 夜間放射計算
  - 対流熱伝達率

非標準のコンポーネント

- TRNLIB – **ユーザが作ったオンライン･ライブラリ**
  - ASHRAE **ツールキット**
  - HVACSIM+ **モデル**
  - SEL**の学生が作ったコンポーネント**
  - TRNSYS**ユーザが作り公開しているコンポーネント**
- **有料の非標準のライブラリ**
  - TESS (Thermal Energy Systems Specialists; USA)
  - Transsolar (Germany)

2 TESS

- モデリングとシミュレーションやソフトウェア開発
- エネルギーコンサルタント （ＥＳＣＯを含む）

ASHRAE
Bergquam Energy Services
California Energy Commission
CDH Energy Corporation
ClimateMaster Inc. Co-Energy Group
Data & Strategies Group Inc.
Duke Engineering and Services Inc.
Duke Solar Incorporated
Enlink GeoEnergy Services Inc.
Innovative Design Inc.
Korean Institute of Energy Research
National Institute of Standards
National Renewable Energy Laboratory
Oak Ridge National Laboratory
Powerlight Corporation
Quantam Group Engineering
Research Products Corporation
Solar Enterprises International
Solar Power Incorporated
University of New Mexico
Wisconsin Public Service Corporation

TESSの非標準コンポーネント(1)

- *HVAC* ***コンポーネント***
  - Adiabadic humidifier
  - Single speed fan
  - Simple furnace
  - Two speed fan
  - 5-stage room thermostat
  - 100-port air supply plenum
  - 100-port flow diverter
  - 100-port air return plenum
  - 100-port flow mixer
  - Heat exchanger w/ hot bypass and cold set point
  - Residential cooling coil
  - Heat exchanger w/ hot bypass and hot set point
  - Radiant floor
  - Constant speed pump

- *HVAC (****続き****)*
  - Air cooled chiller
  - Variable speed pump
  - Heat exchanger w/ cold bypass
  - Humidistat
  - Proportional boiler
  - Simple multizone building
  - Delayed inputs
  - Variable speed fan
  - Unit heater (w/ or w/out outside air
  - Air source heat pump
  - Water cooled chiller
  - Proportional controller
  - Heating coil
  - n-stage differential controllers
  - 2-pipe console unit

TESSの非標準コンポーネント(2)

- *HVAC (**続き**)*
  - Steam-fired double-effect absorption chiller
  - Direct-fired double-effect absorption chiller
  - Hot water-fired double-effect absorption chiller
  - Steam-fired single-effect absorption chiller
  - Direct-fired single-effect absorption chiller
  - Hot water-fired single-effect absorption chiller
  - Flow stream loads
  - 3 stage aquastats
  - water source heat pumps
- ***蓄熱コンポーネント***
  - Rectangular tank with optional heat exchanger
  - Spherical tank with optional heat exchanger
  - Horizontally cylindrical tank with optional heat exchanger
  - Vertically cylindrical tank with optional heat exchanger
  - 3-stage aquastat for heating
  - 3-stage aquastat for cooling

TESSの非標準コンポーネント(3)

- ***地中熱源ヒートポンプ・コンポーネント***
  - Detailed buried pipe
  - Vertical u-tube ground heat exchanger
  - Ground temperature
  - Water source heat pumps
- ***ユーティリティ・コンポーネント***
  - Infiltration into a conditioned zone
  - Equipment fouling
  - Average day profiles
  - Occupancy loads
  - Sky temperature
  - Bin sorter
  - Random number (uniform distribution)
  - Random number (normal distribution)
  - n-level forcing function
  - Parametrics output
  - Ground temperature

TESSの非標準コンポーネント(4)

- ***太陽熱コンポーネント***
  - Linear parabolic concentrator
  - Flat plate with set point temperature
  - Evacuated tube
  - Flat plate collector with capacitance
  - Flat plate Integral Collector Storage system
  - Tray top Integral Collector Storage system
  - Single cover top loss
  - Double cover top loss
  - Tray top angle finder
- ***アプリケーションコンポーネント***
  - 7-day slider
  - 1-day slider

TESSの非標準コンポーネント(5)

- ***コージェネ・コンポーネント***
  - Load following steam turbine with multiple inj./extrac.
  - Flow following steam turbine
  - Heat recovery steam generators (many modes)
  - 100-port steam diverter
  - 100-port steam mixer
  - Steam pressure reducing valve
  - Condensate pump
  - Steam condenser
  - Electrical generator
  - Steam condenser
  - Condensate preheater
  - Feedwater heater (closed/open)
  - Desuperheater
  - Flash tank
- ***コージェネ・コンポーネント (続き.)***
  - Steam pipe
  - Steam separator
  - Steam heat exchanger
  - Steam superheater
  - Supplemental firing device
  - Gearbox
  - Evaporative cooler
  - Fogging device
  - Simple cooling coil
  - Steam boiler
  - Steam end use device
  - Steam trap
  - Steam fired absorption chillers

3 学協会 ASHRAE

- http://www.ashrae.org/

- **ソフトウェアを扱っている会社の紹介**

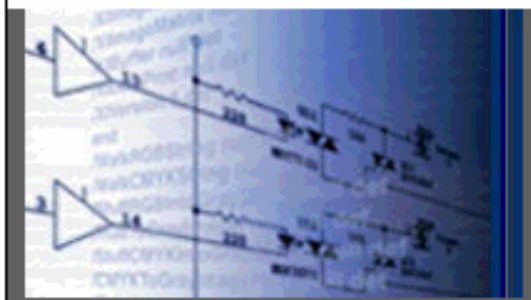
  →ASHRAE Product & Service Directory

ASHRAE

An International Organization

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

Engineering for the World We Live In



HVAC&R Information

ASHRAE Activities & Membership

HVAC&R Marketplace

ASHRAE Journal
ASHRAE Learning Institute
ASHRAE Store
eNewsletter and Listservs
HVAC&R Research Journal
Technical FAQ
More . . .

What's New At ASHRAE

>> ASHRAE Report: Building Health and Safety Under Extraordinary Incidents

BOOKSTORE

>> Standards, PDFs, software, courses and more...

Fuel Cells for Building Applications
is now available at the ASHRAE bookstore

ASHRAE
Engineering for the World We Live In

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member number

PIN

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site shortcuts Please select... Go

Go

ASHRAE Product & Service Directory

Main : Computers & Software : Software : **Software (General)**

Our Directory listings are organized into sub-categories. Please make the appropriate sub-category selections, and y
will arrive at a list of company directories.

Click on a listing to view information about that particular company. Companies and businesses that have extended listing information in our directory are prominently designated with bold text and icons.

Place a Directory Listing

- HVAC&R Information
- ASHRAE Activities & Membership
- HVAC&R Marketplace
- Advertising Information
- HVAC&R Business Classifieds
- HVAC&R Employment Classifieds
- Industry Reference
- Product & Service Directory
- White Papers

- JOIN ASHRAE
- BOOKSTORE
- STUDENTS
- PRODUCT & SERVICE DIRECTORY
- MEETINGS AND

Companies

Company Name	City	State
Dexter + Chaney	Seattle	WA
Eagle Technology, Inc.	Mequon	WI
kW Engineering	Oakland	CA
GCC Inc.	Lewisville	TX
Autodesk, Inc.	San Rafael	CA
Open Systems, Inc.	Shakopee	MN
Tridium, Inc.	Richmond	VA
Lindab, Inc.	Stamford	CT

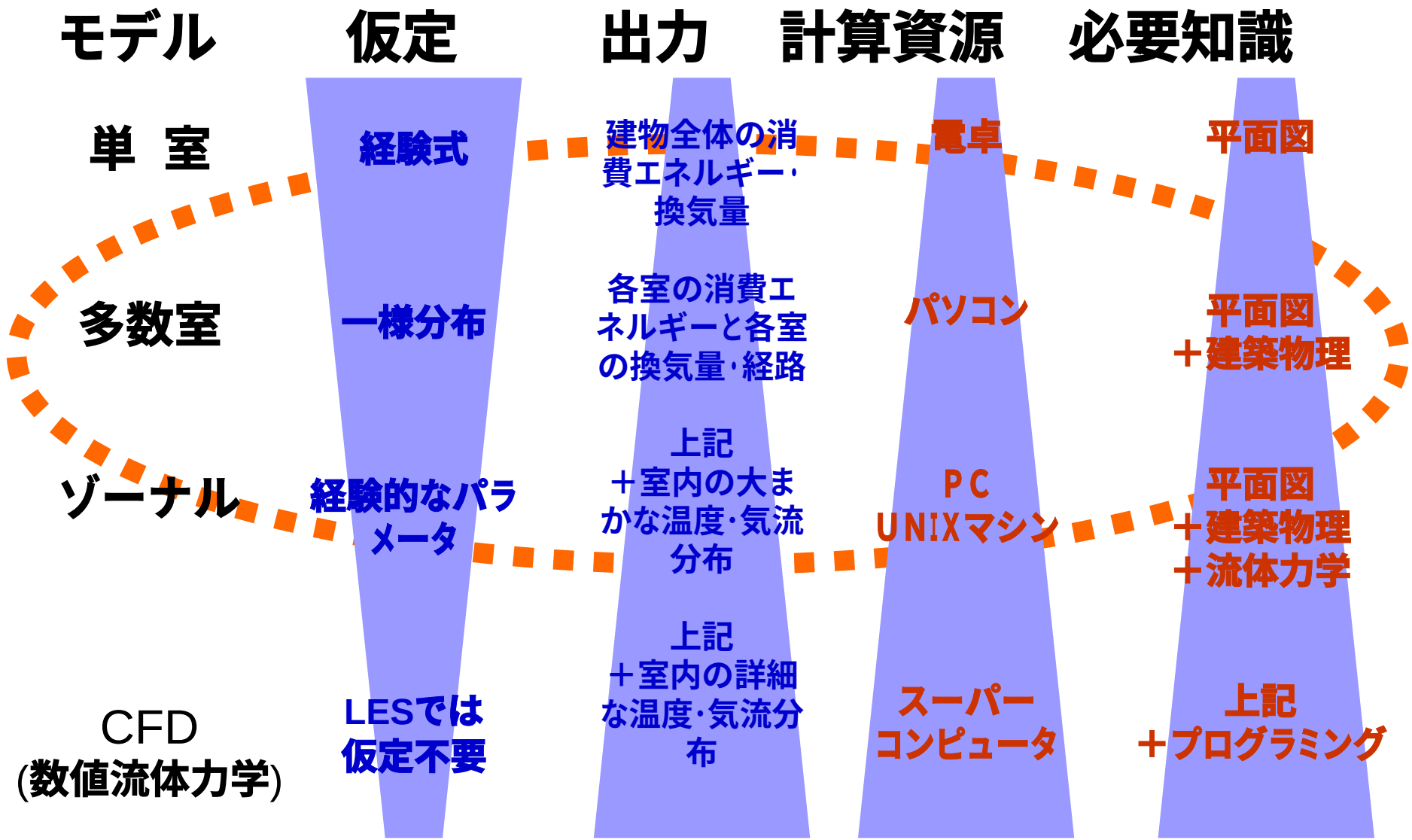
インターネット

プログラム/ライブラリの使い方

- 研究　　正確さ
- 機器･システム開発　　性能評価
- コンサルタント　　柔軟さ
- 定型的な設計等の業務　入出力のしやすさ
- プレゼンテーション 表現の力　　ＶＲ

→使い手が何のために何を重視するのか

熱･空気関連のプログラム/ライブラリの種類



プログラム/ライブラリの特徴
空気･熱関連

- 経験則　地域や人により異なる
- 簡易式　応用範囲が狭い
- 質点系　最も実際的なシミュレーション
  経験則と簡易式を検証できる
  プロジェクトの問題点をチェックできる
  CFDへの境界条件を与えられる

・ＣＦＤ (計算流体力学)　精密なシミュレーション
  高価、時間がかかる

お わ り に

- 環境工学に関するプログラム･ライブラリの
  作り手と使い手　　→ 各セクターの関係
- DOEとASHRAEのHPの紹介

- プログラム/ライブラリをさがすには
  どの立場で何に使うのかを明確にする

→ 日本でのプログラム/ライブラリの公開が必要