International activities of UNISEC and
Proposal of UNISEC-Global

October 22, 2013, UN/UAE Symposium, Dubai

Rei Kawashima

University Space Engineering Consortium (UNISEC)

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Outline

- Introduction – What is UNISEC?

- What UNISEC has done in Japan ?

- What enabled UNISEC to achieve them ?

- UNISEC International Contributions
  - Nano-satellite Mission Idea Contest (MIC)
  - Cansat Leader Training Program (CLTP)
  - Nano-satellite Symposium

- Proposal of UNISEC-Global

- The 1st UNISEC-Global Meeting

What is UNISEC (Japan)?

- UNISEC: "University Space Engineering Consortium"

- NPO/NGO to facilitate/promote university level students' practical space development activities, such as designing, manufacturing and launching small satellites and hybrid rockets.

- Established in 2002

- 60 laboratories/groups from 40 universities

- 670 student members and 250 supporters

- 3 pillars: Human resource development, Technological development, Outreach

Major UNISEC Activities

- Distribute R&D funds from space enterprise and government
- Engage UNISEC members with space companies (technical/component/facility support, consulting)
- Work on legal issues (frequency band, etc.)
- Work on safety issues
- Find launch opportunities
- Technology exchange, joint development/purchase
- Symposium/workshop/study group, conference
- Local outreach activities

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Achievements (Satellite side)
20 university satellites launched in 10 years

Satellites Born From UNISEC Activities

2012

Horyu II
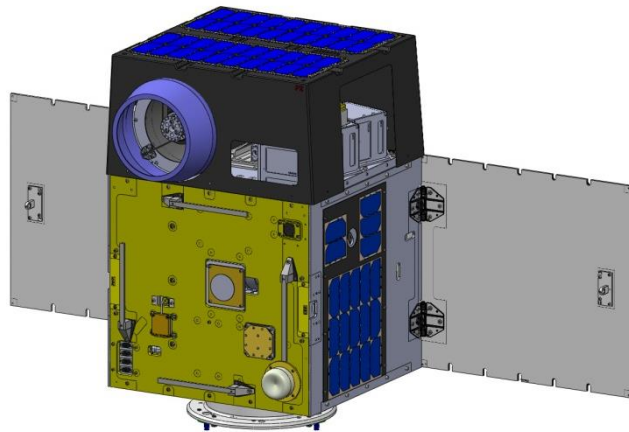Kyushu Inst. of Tech.
May 18, 2012

PROITERES
Osaka Inst. of Tech.
Sep 9, 2012

FITSAT-1
Fukuoka Inst. of Tech.
Oct 10, 2012

RAIKO
Tohoku Univ. and
Wakayama Univ.
Oct 10, 2012

PRISM
Tokyo Univ.
Jan 23, 2009

SPRITE-SAT
Tohoku Univ.
Jan 23, 2009

KKS-1
Tokyo Met. College Of
Industrial Tech.
Jan 23, 2009

UNITEC-1
UNISEC
May 21, 2010

WASEDA-SAT2
Waseda Univ.
May 21, 2010

Negai☆"
Soka Univ.
May 21, 2010

STARS
Kagawa Univ.
Jan 23, 2009

KSAT
Kagoshima Univ.
May 21, 2010

XI-IV
Tokyo Univ.
June 30, 2003

CutI-1
Tokyo Inst. of Tech.
June 30, 2003

XI-V
Tokyo Univ.
Oct 27, 2005

CutI-1.7+APD
Tokyo Inst. of Tech.
Feb 22, 2006

SEEDS (FM1)
Nihon Univ.
Jul 27, 2006

HITSAT
Hokkaido Inst. of Tech.
Sep 23, 2006

SEEDS (FM2)
Nihon Univ.
Apr 28, 2008

CutI-1.7+APD II
Tokyo Inst. of Tech.
Apr 28, 2008

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2009   2003   2008   2010

From CanSat to CubeSat, Nano-Satellite
From Educational purpose to Practical application

5

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Leading to Really Practical Satellites

Hodoyoshi-3
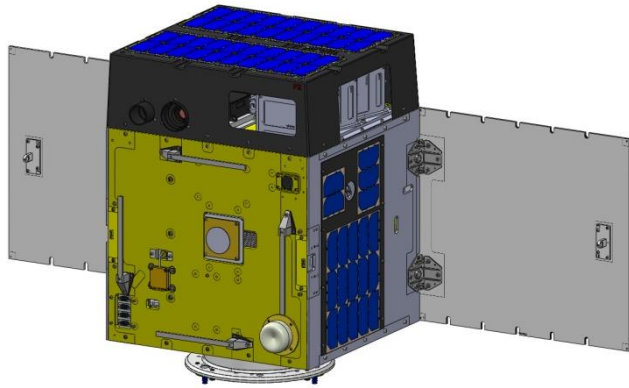
Based on a Standard bus

Hodoyoshi-4

Rocket: DNEPR launch in 2013-2014

	Hodoyoshi-3	Hodoyoshi-4
Size	0.5 × 0.5 × H0.65m	0.5 × 0.6 × H0.7m
Weight	60kg	66kg
Orbit	SSO. 600km, LTAN 10am～11am	
ACS	Earth pointing, 3 axis stabilization	
Power	Power generation: max 100W Power consumption: average 50 W Bus voltage: 28V, 5V Battery: 5.8AH Li-Ion	

Commu-nication	H/K and Command: S-band
	  uplink:4 kbps, downlink:4/32/64 kbps
	Mission data downlink: X-band 10Mbps
	  (100Mbps to be tested on Hodoyoshi-4）	

Orbit control	H_2O_2 propulsion	Ion-thruster (Isp: 1100s)
Missions	Mid-resolution optical camera GSD: 40m & 200m	High-resolution optical camera GSD:5m
	Store & Forward Hosted payloads (10cm cube x 5) Hetero-constellation experiment	

6

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Achievements (rocket side)

- CAMUI rocket reached 7 km altitude

- Many universities challenged various type rocket;
  - Model rockets   - Winged flyback rockets
  - "No combustion" type rockets

Hokkaido Univ.
CAMUIロケット

Tokai Univ. TSRP

7

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Achievements (human resource development)

- Provide many engineers/researchers who have
  - Project management skills
  - Proficient knowledge of satellite/rocket and their subsystem design and manufacturing
  - Systems engineering and integration
  - "Guts" to tackle challenging problems
- to space development field in Japan as well as many other technological areas such as car, aircraft plant, electrics/electronics, construction, etc.

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What enabled UNISEC to achieve them ?

- UNISEC provided university students with the opportunities to see;
  - What other university achieved and how, leading to
    - strong motivation (we can do the similar thing !!)
    - hints to achieve something (rocket, satellite, CanSat,--)
    - rivalry feeling (if they can, we want to do it better !!)
- Highly motivated leading persons (such as professors) continually have considered what they can do without enough budget.

  ("No budget" cannot be an excuse.)

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UNISEC International Contributions

Cansat Leader Training Program (CLTP)

Mission Idea Contest (MIC)

Nano-satellite Symposium

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1) CanSat Leader Training Program (CLTP)

CLTP was established in 2011 to contribute to capacity building in space technology and to improve teaching methods-based space engineering education.

- A one month course gives training through whole cycle of CanSat development including sub-orbital launch experiments
- Participants are expected to teach their students CanSat program in their countries
- Aiming at "international CanSat education network"

"Give a man a fish and you feed him for a day. Teach him how to fish and you feed him for a lifetime."

http://www.cltp.info
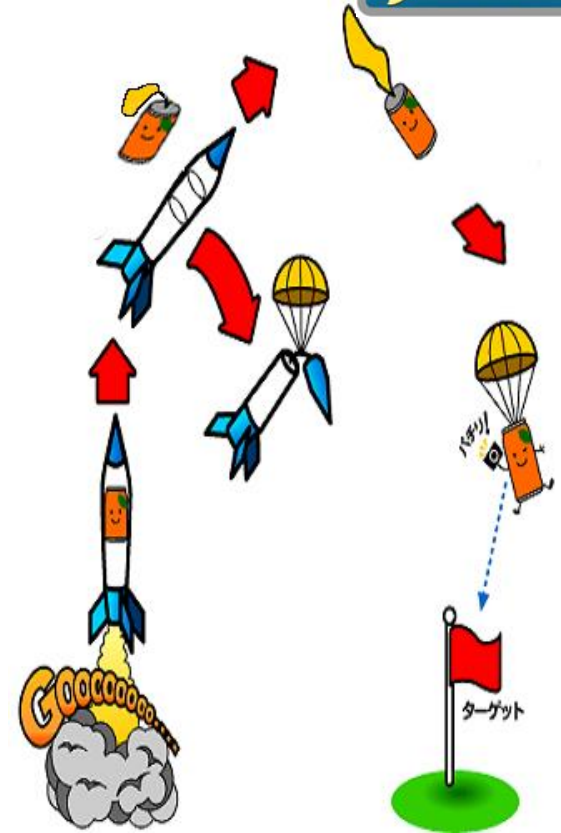
CLTP Participants

CLTP1 (Wakayama Univ. in Feb-March, 2011)
12 participants from 10 countries, namely Algeria, Australia, Egypt, Guatemala, Mexico, Nigeria, Peru, Sri Lanka, Turkey, Vietnam.

CLTP2 (Nihon Univ. in Nov-Dec, 2011)
10 participants from 10 countries, namely Indonesia, Malaysia, Nigeria, Vietnam, Ghana, Peru, Singapore, Mongolia, Thailand, Turkey.

CLTP3 (Tokyo Metropolitan Univ. in July-August, 2012)
10 participants from 9 countries, namely Egypt (2), Nigeria, Namibia, Turkey, Lithuania, Mongolia, Israel, Philippines, Brazil

CLTP4 (Keio Univ. in July-August, 2013)
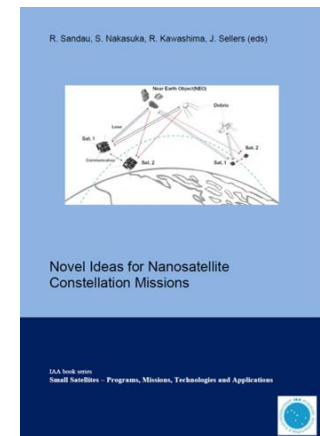9 participants from 6 countries, namely Mexico(4), Angola, Mongolia, Philippines, Bangladesh, Japan

CLTP5 will be held in Hokkaido Univ in August 25- Sept 20
Application deadline : Feb 28, 2014

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# 2) Mission Idea Contest (MIC) for Micro/nano satellite utilization

- Objective: Encourage innovative exploitation of micro/nano-satellites to provide useful capabilities, services or data.

- Regional coordinators: 33 regions

- MIC1 in Tokyo, March 14, 2011

- MIC2 in Nagoya, Oct. 10, 2012
  – 72 applications from 31 countries
  – Publication in cooperation with IAA

R. Sandau, S. Nakasuka, R. Kawashima, J. Sellers (eds)

Novel Ideas for Nanosatellite Constellation Missions

IAA book series
Small Satellites – Programs, Missions, Technologies and Applications

http://www.spacemic.net

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PreMIC3 Workshop - Nov 23, 2013

- User ideas are collected first, then, developers applied to design to realize the user idea. The review team evaluated and made matching.

- Selected teams will make presentation.
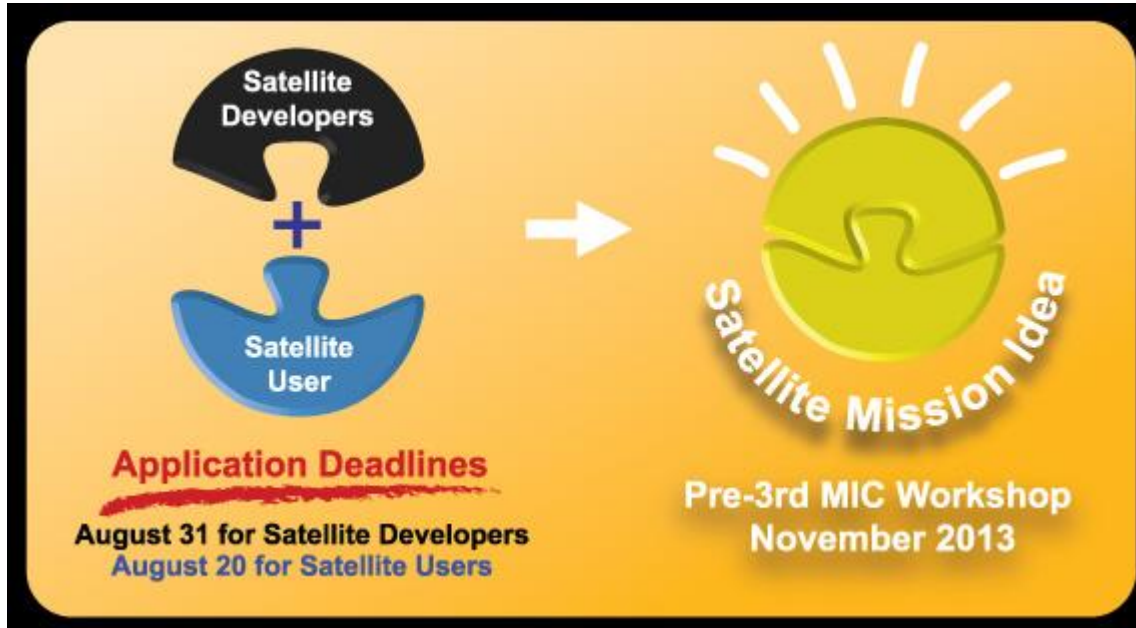
Selected Mission Ideas/teams in Pre-MIC3

Microgravity Experiment Recovery Satellite (MERS)	Canada	Australia
6S Initiative (Satellites - Schools - Science - Simple - Space – Students)	Brazil	Italy
Utilizing Nano Satellites for water monitoring for Nile River	Egypt	Japan
PHASES: ultra-precise absolute flux spectroscopy of stars from space	Mexico	Finland
Monitoring Natural Disasters with Small Satellites	Slovenia	Israel

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3) Nano-satellite Symposium

- **1st Symposium (June 10-11, 2010, Tokyo)**
  - 300 participants from 13 countries

- **2nd Symposium (March 14, 2011, Tokyo)**
  - 85 participants from 21 countries (March 15-16 were cancelled for earthquake)

- **3rd Symposium (Dec 12-13, 2011, Kitakyushu)**
  - 220 participants from 31 countries

- **4th Symposium (Oct12-13, 2012, Nagoya)**
  - 290 participants from 43 countries

- **5th Symposium (Nov 20-22, 2013, Tokyo)**

http://www.nanosat.jp

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Global Network Established by UNISEC
(MIC:33, CLTP: 24 countries) 38 countries in total
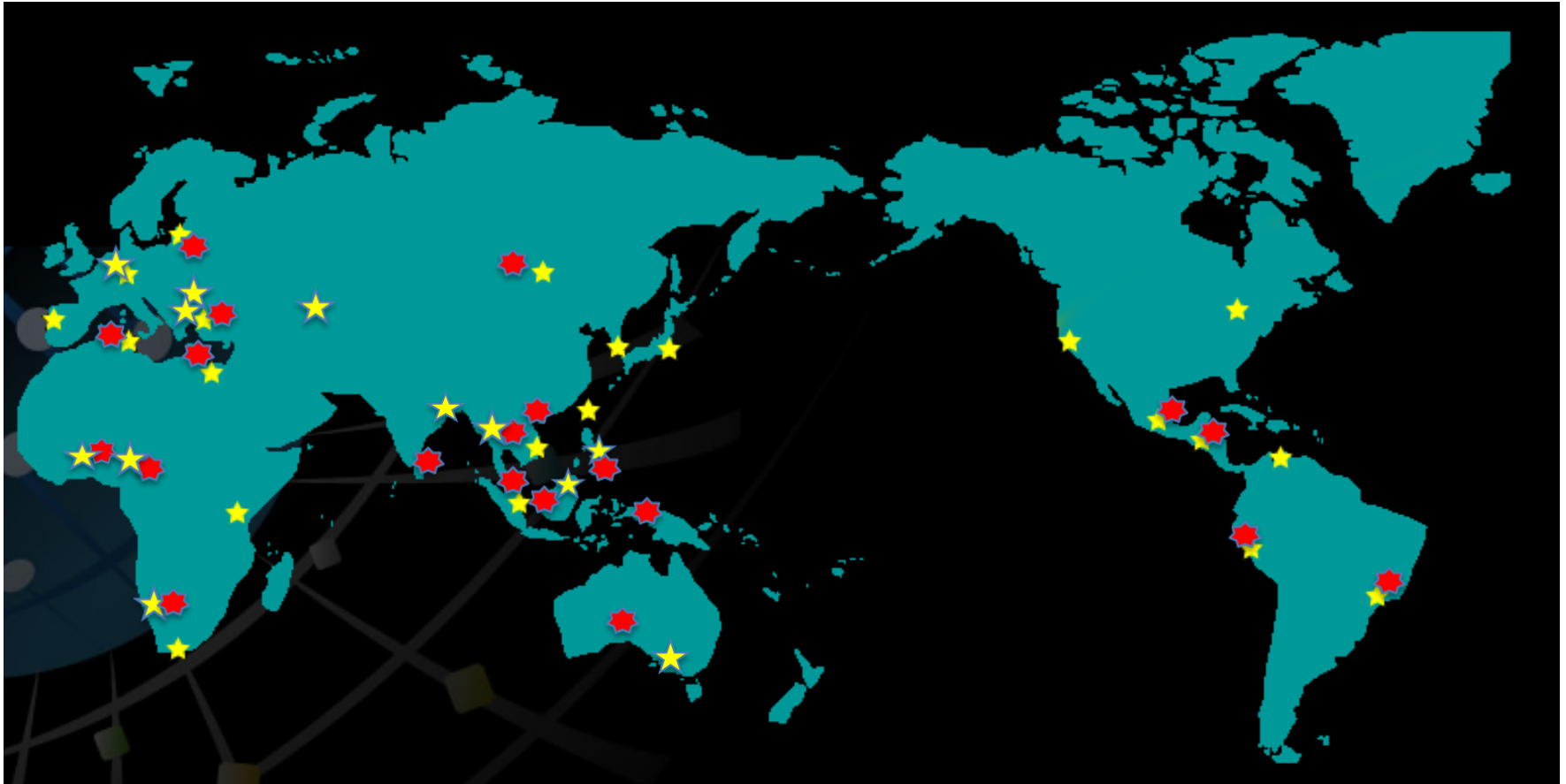
⭐ : CLTP participant   ⭐ : MIC coordinator

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Proposal of UNISEC-Global

"By the end of 2020, let's creat a world where university students can participate in practical space projects in more than 100 countries"

www.unisec-global.org

Vision of UNISEC-Global - 2020-100

- *"By the end of 2020, let's create a world where university students can participate in practical space projects in more than 100 countries"*

When several UNISEC-xxx have been established, let's establish a new organization "UNISEC-Global" to support UNISEC-local chapters

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How to start UNISEC? (1) Find right persons

- **Find 2 or more than 2 universities to form "consortium"**

- **Find your peers** (core members are important)
  - Students who would work on projects with you
  - Other professors/lectors who will cooperate with you in your university

- **Find/make funds** (stable income is important)

- **Find program/projects** suitable to your current situation (think about availability and ability)

- **Find capable administrative staff**

How to start UNISEC? (2) Take actions

- Organize a workshop in your region to seek players, supporters, financial resources, information and anything you need to launch UNISEC-xxxx (your country/region).

- Establish UNISEC-xxxx, and register to get legal status if necessary.

- Announce that you made UNISEC-xxxx with a list of member universities and individual members.

- Register UNISEC-Global – after its establishment. Meanwhile, contact UNISEC at einfo@unisec.jp.

Proposal of UNISEC-Global

- When several UNISEC- xxxs (each region/country) have been established, a new organization called "UNISEC-Global" to support each Local chapter will be established together.

- UNISEC-Japan will support each UNISEC by sharing management know-how, spirits, programs.

- What UNISEC-Global should do will be discussed on the 1st UNISEC Global Meeting scheduled in Tokyo in Nov 23-24, 2013.

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Potential UNISEC-each region

Points of Contact in the following regions:

South Africa region, Angola, Namibia, Egypt, Ghana, Kenya, Nigeria, Tunisia

Bangladesh, Korea, Mongolia, Philippines, Taiwan, Thailand, Turkey, Australia

Canada, USA, Guatemala, Mexico, Peru

Bulgaria, Italy, Samara (Russia)

- Prof. Rüstem Aslan (Turkey)
- Prof. Ayman Kassem (Egypt)
- Prof. Kamel Besbes (Tunisia)

The 1st UNISEC-Global Meeting

- Venue: Takeda-Hall, University of Tokyo, Tokyo, Japan

- Date: Nov 23-24, 2013

- Program includes:
  - Pre-MIC3 (5 team- presentations)
  - UNISEC-activities/expectation reports by more than 20 regions/countries
  - CanSat Education Session
  - Small group discussion
  - Adoption of General Declaration – UNISEC- Global

http://unisec-global.org/

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Important Role of UNISEC-Global

"Univ-univ" relationships in Japan -> "nation(region)-nation(region)"

- UNISEC-Global will provide university students with the opportunities to see;
  - What other students in other region achieved and how, leading to
    - strong motivation (we can do the similar thing !!)
    - hints to achieve something (rocket, satellite, CanSat,--)
    - rivalry feeling (if they can, we want to do it better !!)
- Highly motivated leading persons (such as professors) continually will consider what they can do even without enough budget.
  ("No budget" cannot be an excuse.)

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Register Now!!

The 5th Nano-satellite symposium(11/20-22）

http://www.nanosat.jp/

The 2nd Standardization Workshop (11/19）

http://cent.ele.kyutech.ac.jp/nets_web/nets_web.html

The 1st UNISEC Global Meeting (11/23-24）

http://www.unisec-global.org/

Venue: University of Tokyo

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http://unisec-global.org/

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