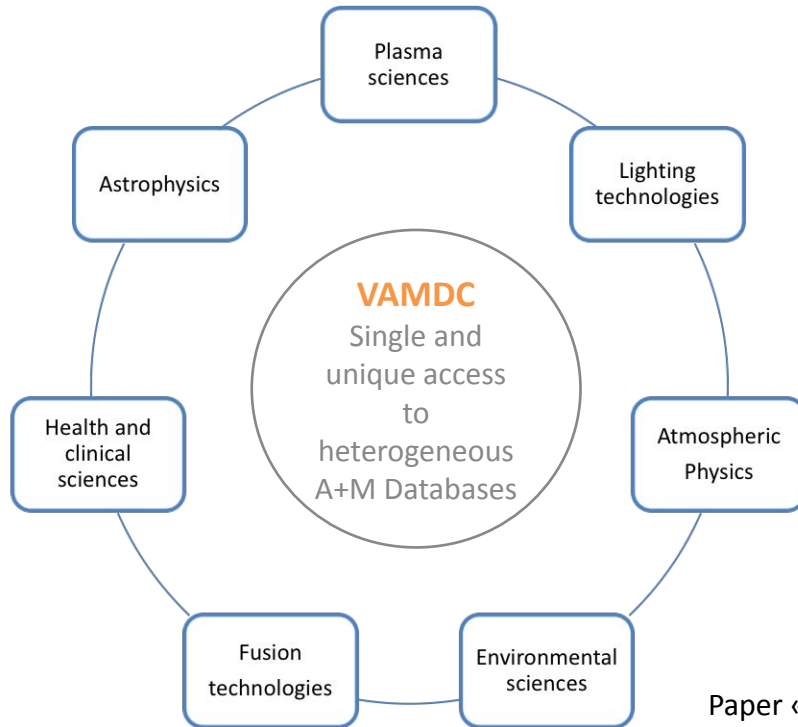

The VAMDC Species database

ASOV 2024 - 18/03/2024

<https://tinyurl.com/asov2024>



The Virtual Atomic and Molecular Data Centre in a nutshell



- E-infrastructure connecting about 40 heterogeneous databases that can be accessed from <http://portal.vamdc.org/> or any VAMDC compatible tools
- Consortium of 25 partners
- High quality scientific data come from different Physical/Chemical Communities
- Provides a large dissemination platform to data producers

Paper « A decade with VAMDC : results and ambition, Atoms, 2020 »

<http://dx.doi.org/10.3390/atoms8040076>

List of interconnected databases

Databases	Type of A&M Data	Partners	Application's Fields
NIFS AMDIS IONIZATION	Electron-impact ionization cross-sections and rate coefficients (atoms & atomic ions)	National Institute for Fusion Science, Toki, Japan, I. Murakami	Stellar, Solar, plasma, fusion
VALD	Atomic Linelists	Uppsalla, Vienna, Moscow – N. Piskunov	Stellar -Solar
NIST Atomic Spectra	Spectroscopy of Atoms –	NIST – Yuri Ralchenko	Stellar – ISM -
CHIANTI	Atomic Linelists and collisions	Cambridge (UK)+MSSL/UCL – H. Mason, G. Rixon	Solar Physics
Spectr-W3	Atomic Linelists and Collisions	Russia (RFNC VNIITF) – P. Loboda	Solar/Stellar Physics + Fusion, plasma
Stark-B	Atomic LineShifts/Broadening with charged perturbers	Observatory of Belgrade (Serbia) + Observatory of Paris (LERMA) – M. Dimitrijevic/S. Sahal-Bréchet	Stellar Physics + Plasmas
TipBase, TopBase	Atomic Linelists and Collisions from Opacity Project and IRON Project	Observatory of Paris (LERMA) + CDS (Strasbourg, Fce) – F. Delahaye/C. Zeppen/C. Mendoza	Stellar, Solar Physics,
SESAM	Electronic Spectra of atoms and molecules	Paris Obs. – E. Roueff	ISM - Stellar

List of interconnected databases

Databases	Type of A&M Data	Partners	Application's Fields
MOLD	Photo-Dissociation Cross-sections	Institute of Physics, Astronomical Obs, Belgrade, Serbia- Vladimir Sreckovic, V. Vujcic, D. Jevremovic	Stellar
BEAM-DB	Molecular/atom—electron collisions	Institute of Physics, Belgrade, Serbia Bratislav Marinkovič	plasma, radiation damage
IDEABD	Dissociative electron attachment upon interaction of low energy electrons with molecules.	Innsbrück F. Duensing	Planets, ExoPlanets, ISM, Radiation Damage
AMBDAS	Collisions in plasmas (bibliographic) - searchable via processes and species	IAEA, Vienna, Austria - C. Hill	Nuclear Fusion

List of interconnected databases

Databases	Type of A&M Data	Partners	Application's Fields
CDMS	Molecular Linelists (mm, Sub-mm)	Cologne (Germany) – S. Schlemmer	ISM + Earth+ CO
JPL	Molecular Linelists (mm, Sub-mm)	Pasadena (USA) + Cologne (Germany) – B. Drouin	ISM + Earth+CO
HITRAN	Molecular Linelists and Broadening Coefficients	Harvard (USA) + UCL – I. Gordon + L. Rothman	Earth, Planets, Exo-Planets
S&MPO	O ₃ linelists	Reims (France)+ Tomsk (Russia) – V. Tyuterev	Earth – Exo-Planets
MeCaSDa	Linelists CH ₄	Dijon (France) – V. Boudon	Earth, Planets, Exo-Planets, Brown dwarfs
SHeCaSDa	Sulfur Hexafluoride Calculated Linelists	Dijon – V. Boudon	Earth
TFMeCaSDa	Tetrafluoro-Methane calculated linelists	Dijon – V. Boudon	Earth
ECaSDa	Ethene Calculated Linelists	Reims – L. Daumont	Earth and Planets
GeCaSDa	GeH ₄ Linelists	Dijon – V. Boudon	Planets

List of interconnected databases



Databases	Type of A&M Data	Partners	Application's Fields
RuCaSDa	RuO_4 Linelists	Dijon – V. Boudon	Nuclear Industry
TFSiCaSDa	SiF_4 Linelists	Dijon – V. Boudon	Earth
UHeCaSDa	UF_6 Linelists	Dijon – V. Boudon	Nuclear Industry
CDS-296	CO_2 Linelists (intensity cut-off)	IAO, Tomsk – V. Perevalov	Earth, Planets, Brown Dwarfs
CDS-1000	CO_2 Linelists (intensity cut-off)	IAO, Tomsk – V. Perevalov	Earth, Planets, Brown Dwarfs
CDS-4000	CO_2 Linelists (intensity cut-off)	IAO, Tomsk – V. Perevalov	Earth, Planets, Brown Dwarfs
NOSD-1000	N_2O Linelists (intensity cut-off)	IAO, Tomsk – V. Perevalov	Earth, Planets
NDSD-1000	NO_2 Linelists (intensity cut-off)	IAO, Tomsk – V. Perevalov	Earth, Planets
ASD-1000	C_2H_2 Linelists (intensity cut-off)	IAO, Tomsk – V. Perevalov	Earth, Planets

List of interconnected databases

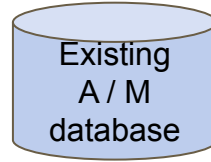
Databases	Type of A&M Data	Partners	Application's Fields
PAH	PAH Theoretical Data and soon experimental Data	Observatory of Cagliari (Italy) – IRAP (Toulouse, France) – G. Mulas+C. Joblin	ISM, Planets, Earth
KIDA	Kinetic Data	Bordeaux (France) – P. Gratier & V. Wakelam	ISM - Planets
UdFA	Kinetic Data (ex-UMIST)	Belfast (UK) – T. Millar	ISM - Planets
BASECOL	Low Energy Molecular Collisions	Observatory of Paris – M.L. Dubernet	ISM - CO
LASP	Solid Spectroscopy Data	Obs. of Catania – G. Leto	Planets, ISM
GhoSST	Solid Spectroscopy Data	Grenoble (France) – B. Schmitt	Planets, ISM
W@DIS	Water Information System	IAO, Tomsk – A. Fazliev	Earth and Planets

To be connected to VAMDC infrastructure

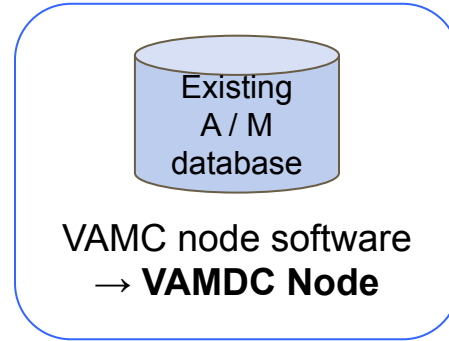


Databases	Type of A&M Data	Partners	Application's Fields
ExoMolOP	Molecular Opacities	University College London, UK – J. Tennyson	Exo, Brown Dwarf, Earth, Stellar
SSHADE	Solid Spectroscopy Data - Interface to infrastructure	Grenoble (France) & other countries – B. Schmitt et al	Earth, Comets, Exo-Planets, ISM, Planets
IAMDB	Indian Atomic and Molecular Database (atomic collisions, A+M spectroscopy)	B. Antony- Indian Institute of Technology, Dhanbad, India E. Krishnakumar - Raman Research Institute, Bangalore, India	Astrophysics, Other
DESIRE	Spectroscopy of sixth row elements (Z=72-86)	Mons University and Liege University, Belgium – P.Quinet, P. Palmeri	Plasmas – Stellar - Solar
DREAM	Radiative data for rare earth	Mons University and Liege University, Belgium – P Quinet, P. Palmeri	Stellar-Solar-Plasmas – Lighting -
PEARL	Atomic Processes	Nuclear data Center, KAERI, Daejon, South Korea Kwon Duck-Hee	Stellar-Solar-Plasmas – Fusion
Clusters	Cluster size distributions, condensation	Innsbrück F. Duensing, P. Scheier	Planets, ExoPlanets, Solvation, Biology
Additional NIFS Databases	Atomic/Molecular processes	National Institute for Fusion Science, Toki, Japan, I. Murakami	Stellar, Solar, plasma, fusion

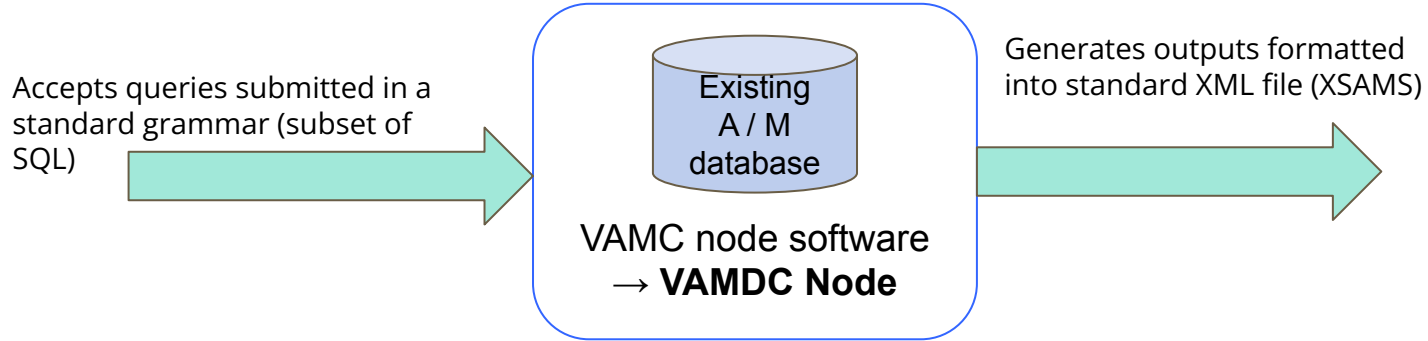
The infrastructure technical architecture



The infrastructure technical architecture

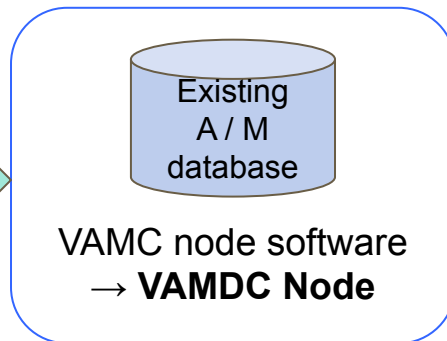
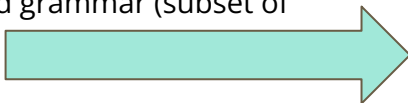


The infrastructure technical architecture



The infrastructure technical architecture

Accepts queries submitted in a standard grammar (subset of SQL)



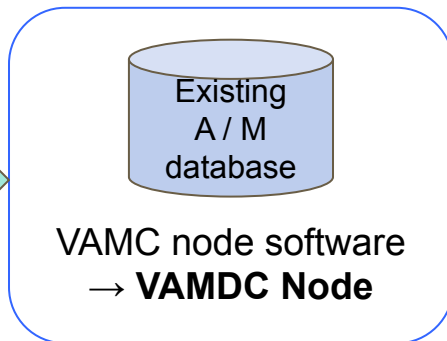
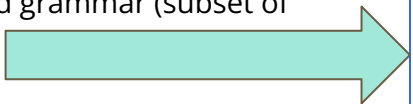
Generates outputs formatted into standard XML file (XSAMS)



<https://standards.vamdc.eu>

The infrastructure technical architecture

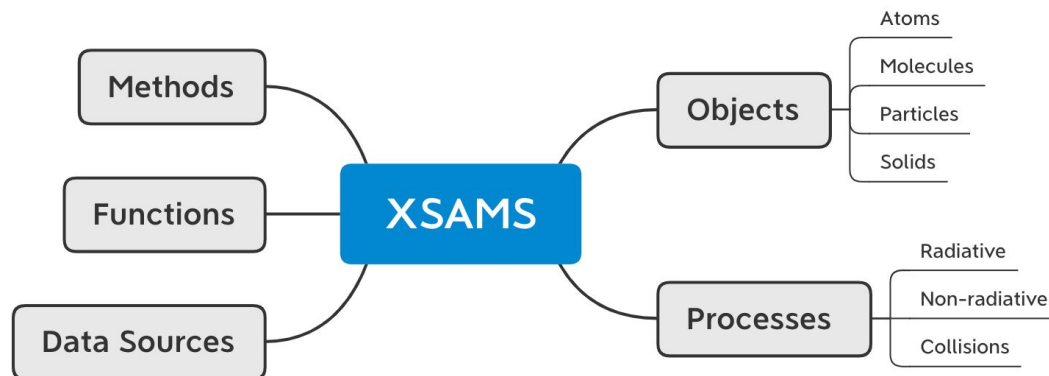
Accepts queries submitted in a standard grammar (subset of SQL)



Generates outputs formatted into standard XML file (XSAMS)

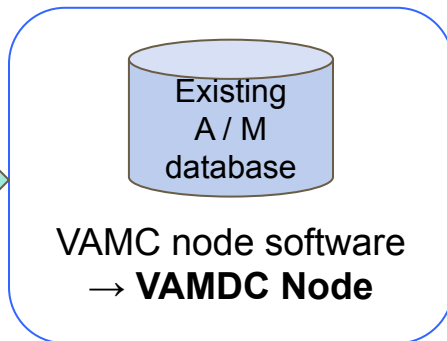
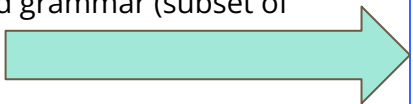


<https://standards.vamdc.eu>



The infrastructure technical architecture

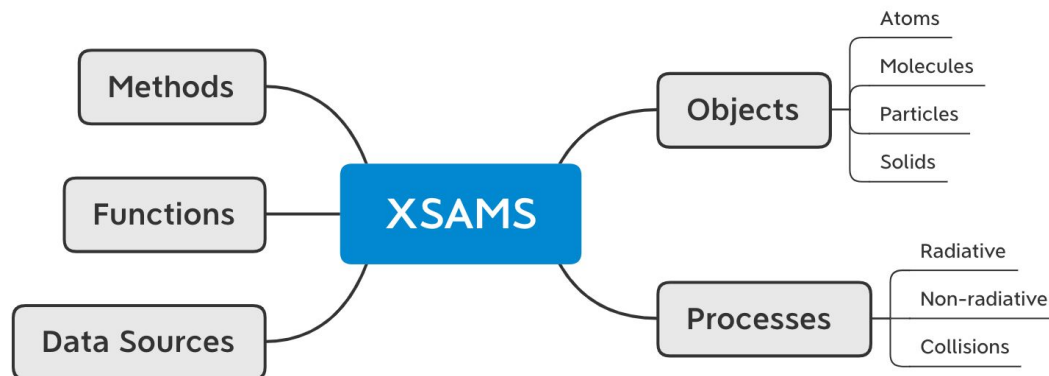
Accepts queries submitted in a standard grammar (subset of SQL)



Generates outputs formatted into standard XML file (XSAMS)

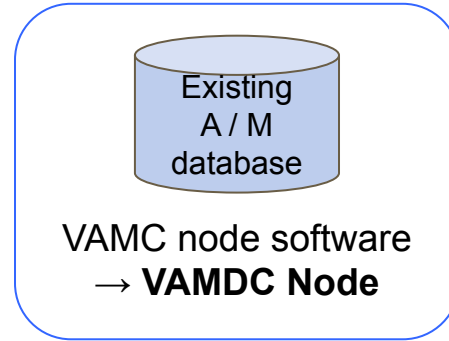


<https://standards.vamdc.eu>

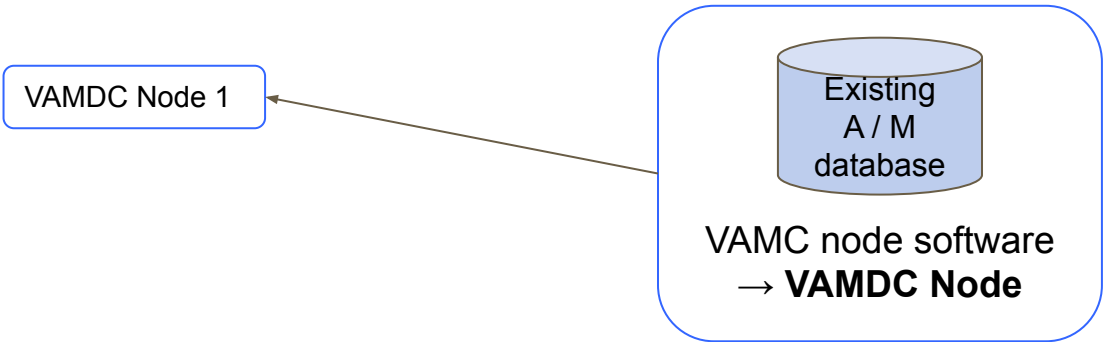


D.R. Schultz, ORNL; E. Roueff,
ML Dubernet, N. Moreau :
Observatoire Paris; S.
Gagarin, P.A. Loboda, VNIITF

The infrastructure technical architecture



The infrastructure technical architecture



The infrastructure technical architecture

VAMDC Node 1



Node N-1

Node N

The infrastructure technical architecture

VAMDC Node 1



Node N-1

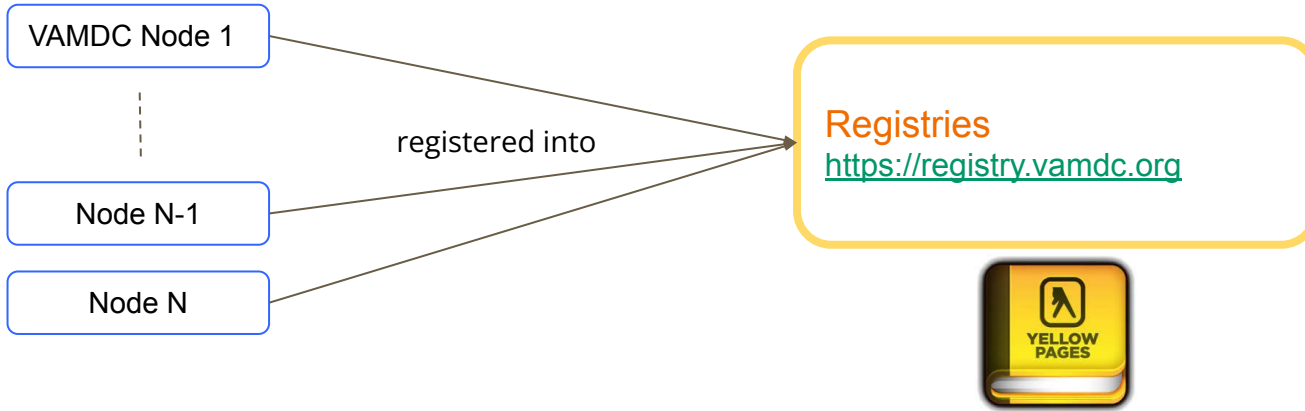
Node N

Registries

<https://registry.vamdc.org>



The infrastructure technical architecture



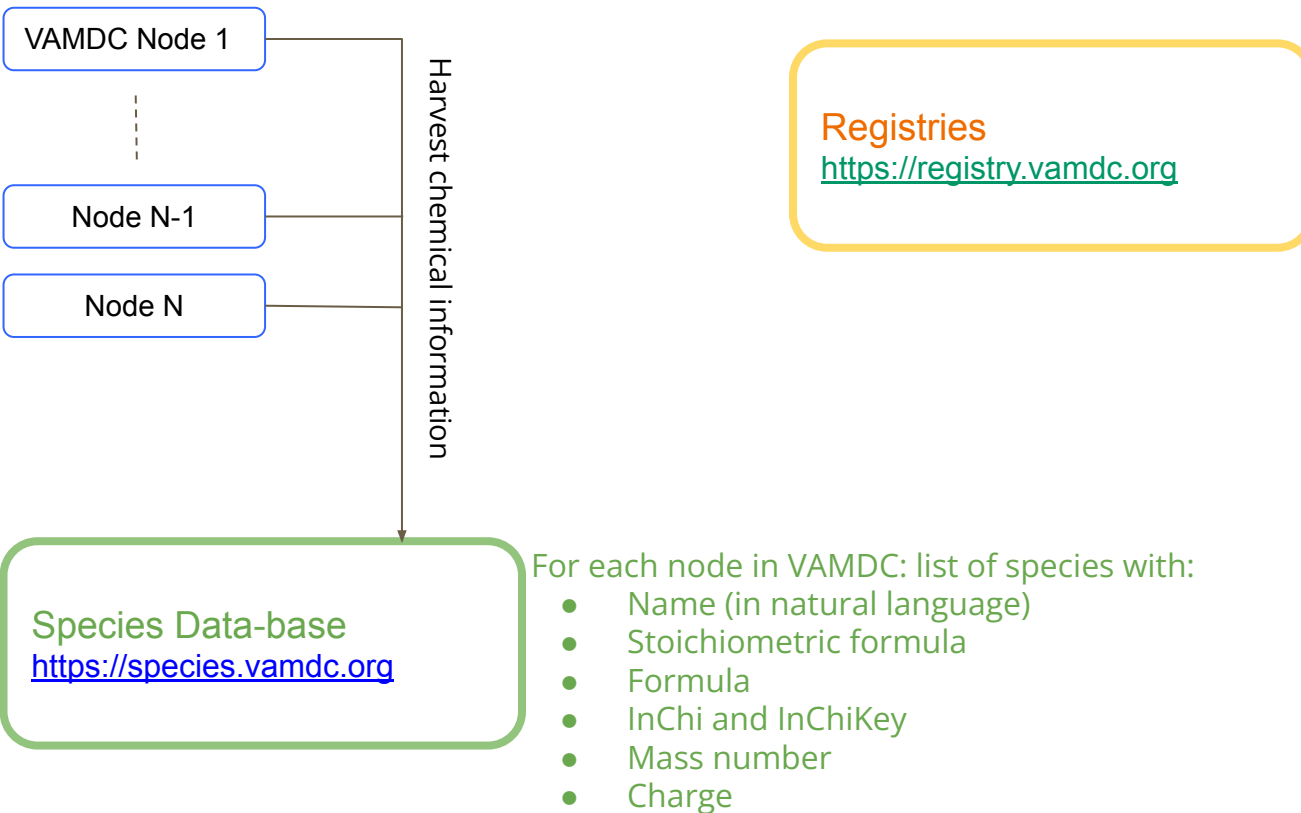
- Node unique identifier
- Scientific and tech. maintainers
- Node capabilities
- Version of implemented standard & protocols

Registries

<https://registry.vamdc.org>



The infrastructure technical architecture



The infrastructure technical architecture

VAMDC Node 1



Node N-1

Node N

Registries

<https://registry.vamdc.org>

Client software

(Portal, Spectcol, MyXclass, ...)

Species Data-base

<https://species.vamdc.org>

The infrastructure technical architecture

VAMDC Node 1



Node N-1

Node N

Registries

<https://registry.vamdc.org>

Client software

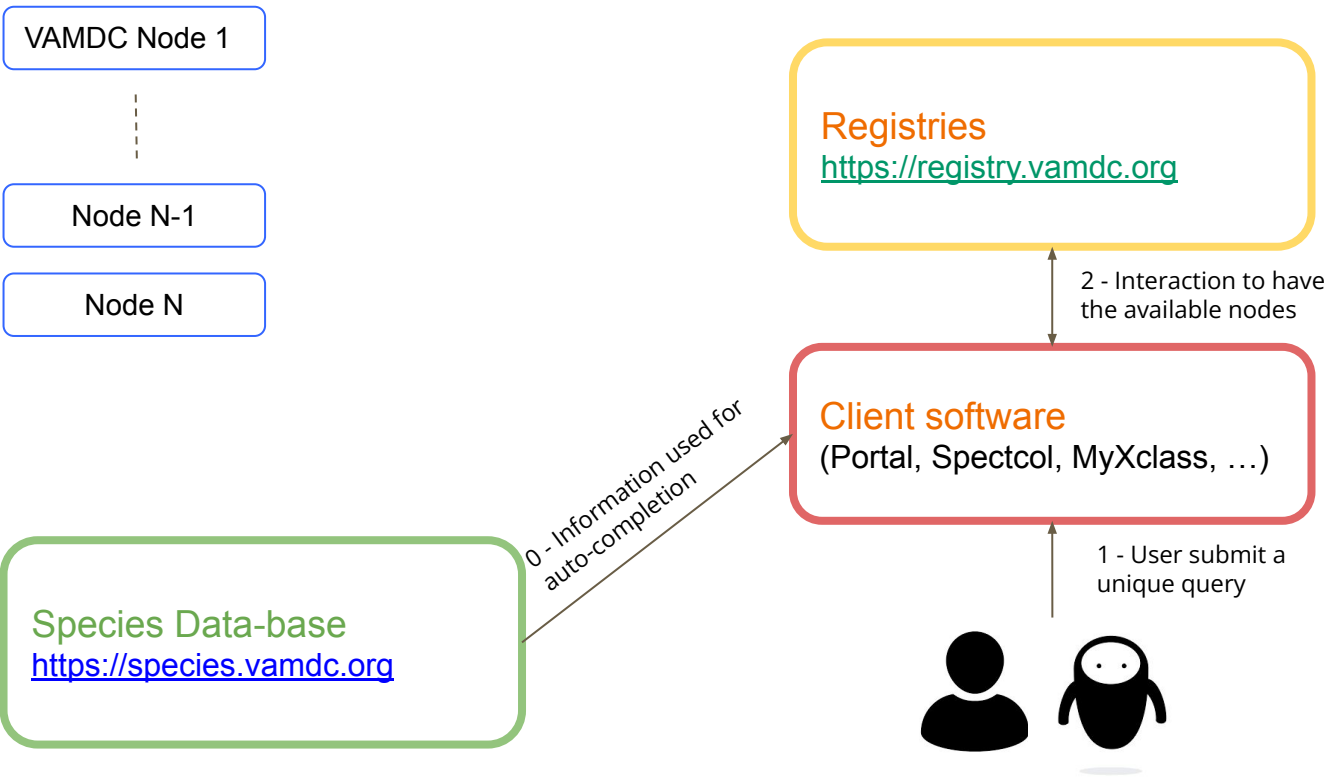
(Portal, Spectcol, MyXclass, ...)

Species Data-base

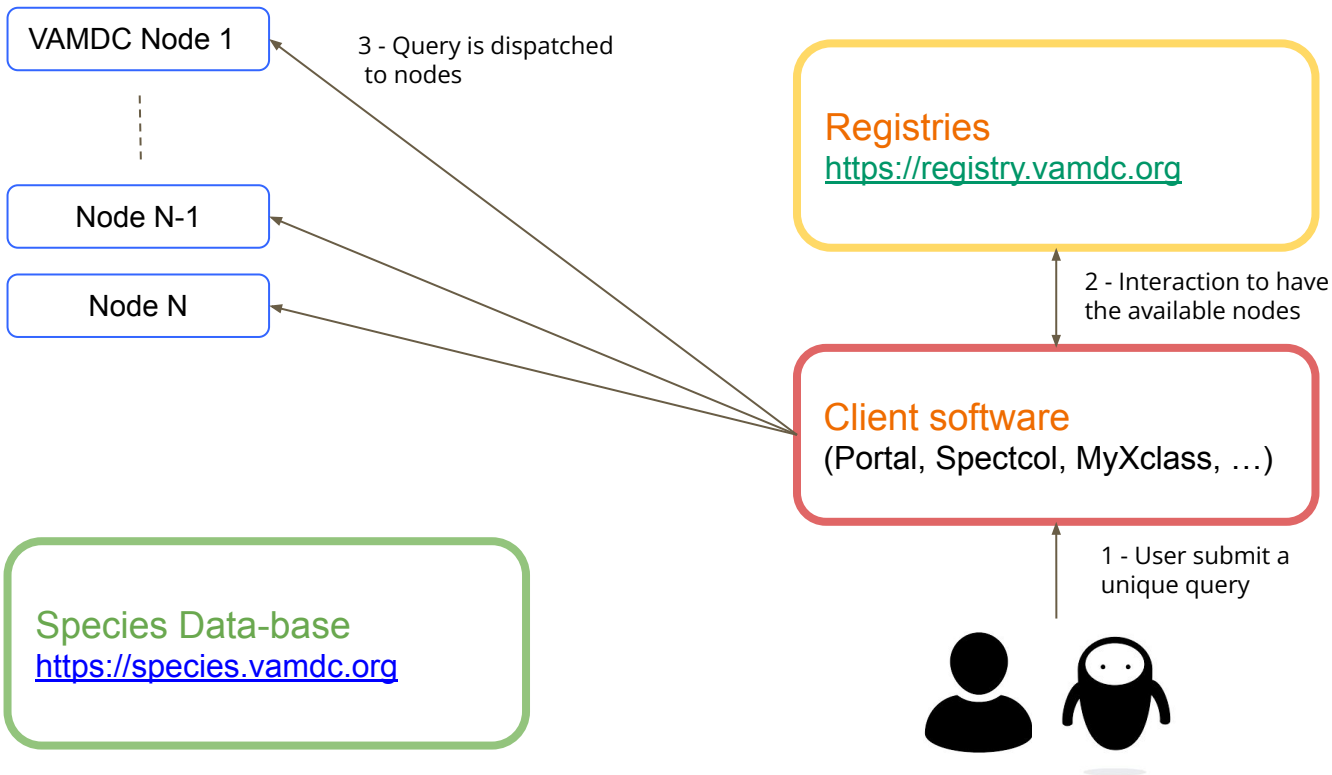
<https://species.vamdc.org>

0 - Information used for
auto-completion

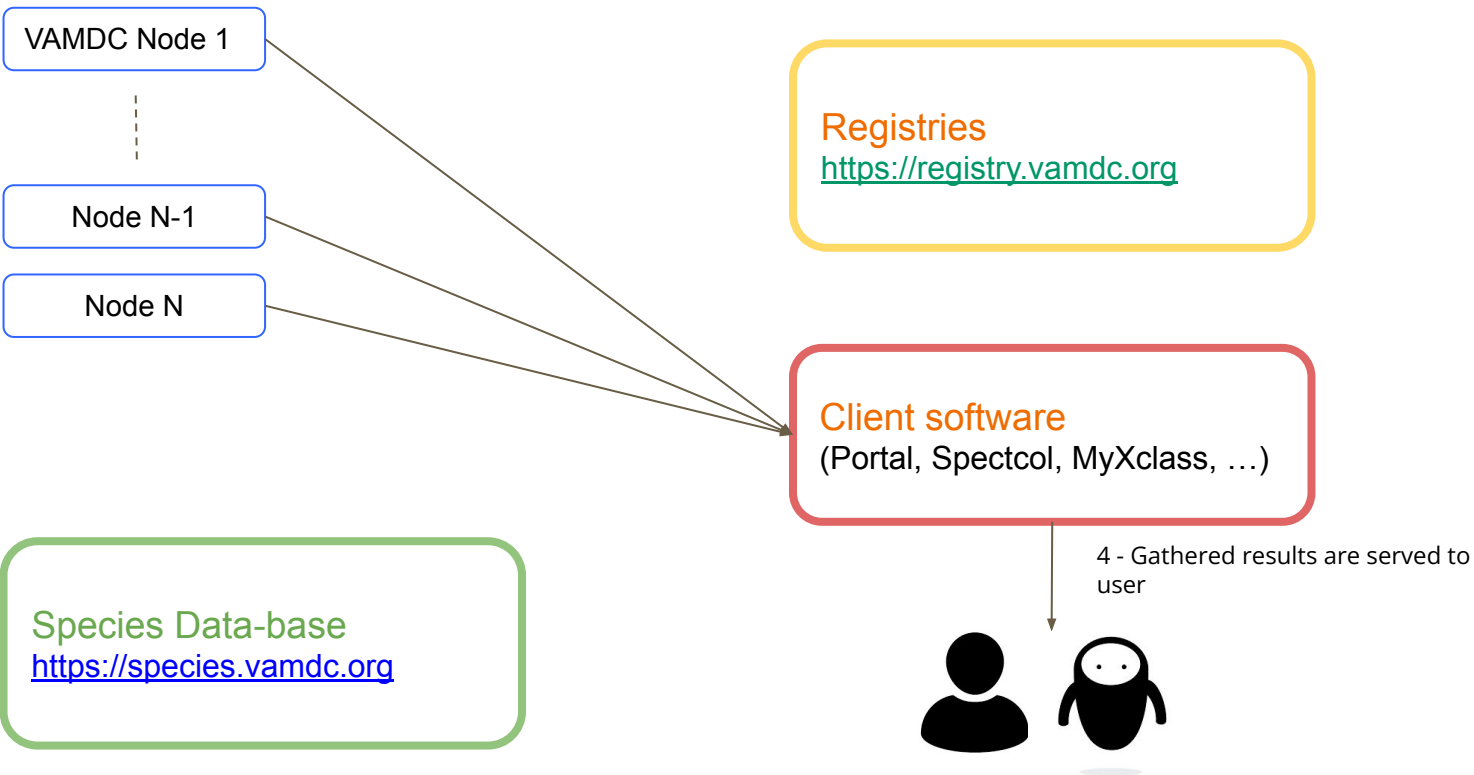
The infrastructure technical architecture



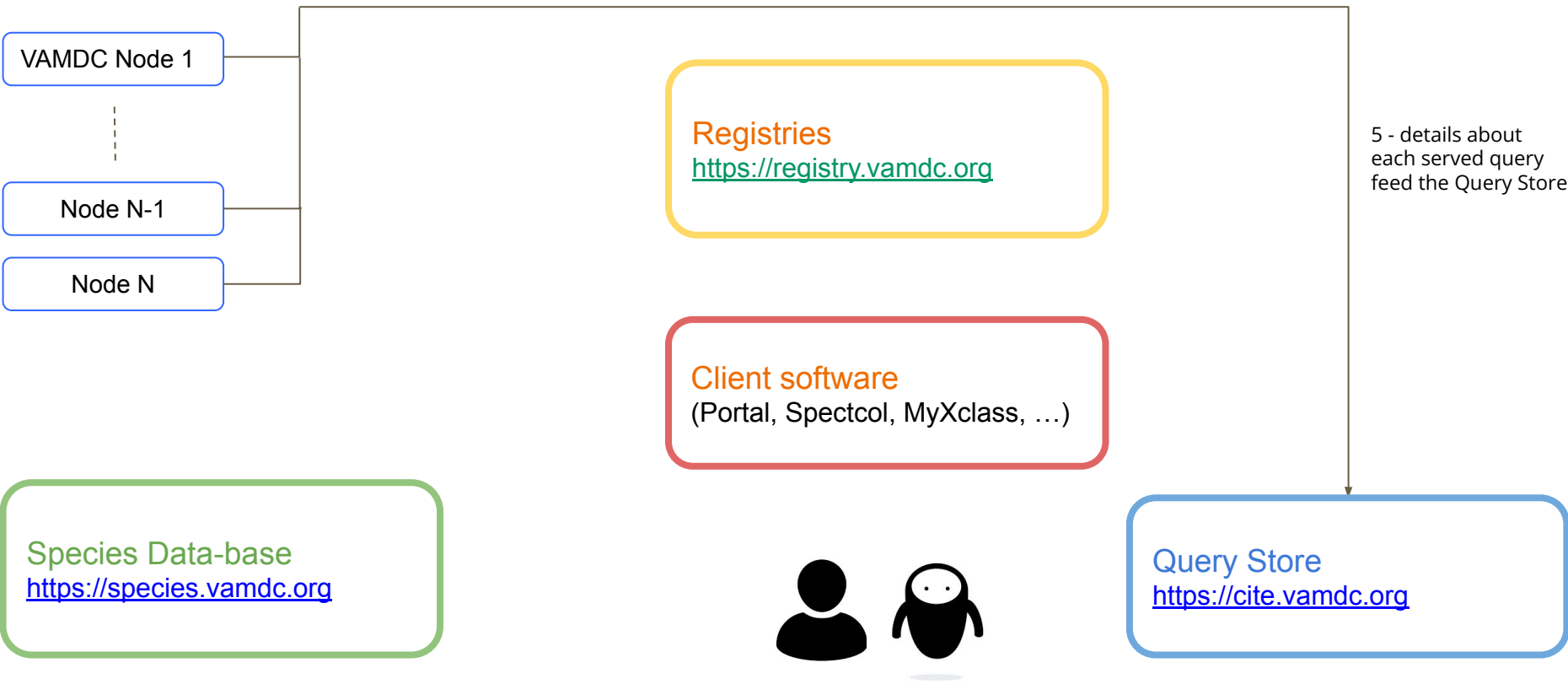
The infrastructure technical architecture



The infrastructure technical architecture



The infrastructure technical architecture



The infrastructure technical architecture



Perspective of a long ongoing process

<http://www.vamdc-project.vamdc.eu/index.php.html>

Marie Lise
Dubernet (MLD)
founded VO-Paris

VAMDC FP7 Eu
project - MLD
project leader

2009

2012

2014

2016

2017

2020

2021

2023

2002

2004

- **IVOA** SLAP and SLDM (with ESAC)
- Starting defining the XSAMS standard

ADASS BoF by M.L. Dubernet, B. Debray about VO-approaches for Atomic and molecular physics
<https://www.adass.org/adass/proceedings/adass02/P2-3/>

Perspective of a long ongoing process

<http://www.vamdc-project.vamdc.eu/index.php.html>

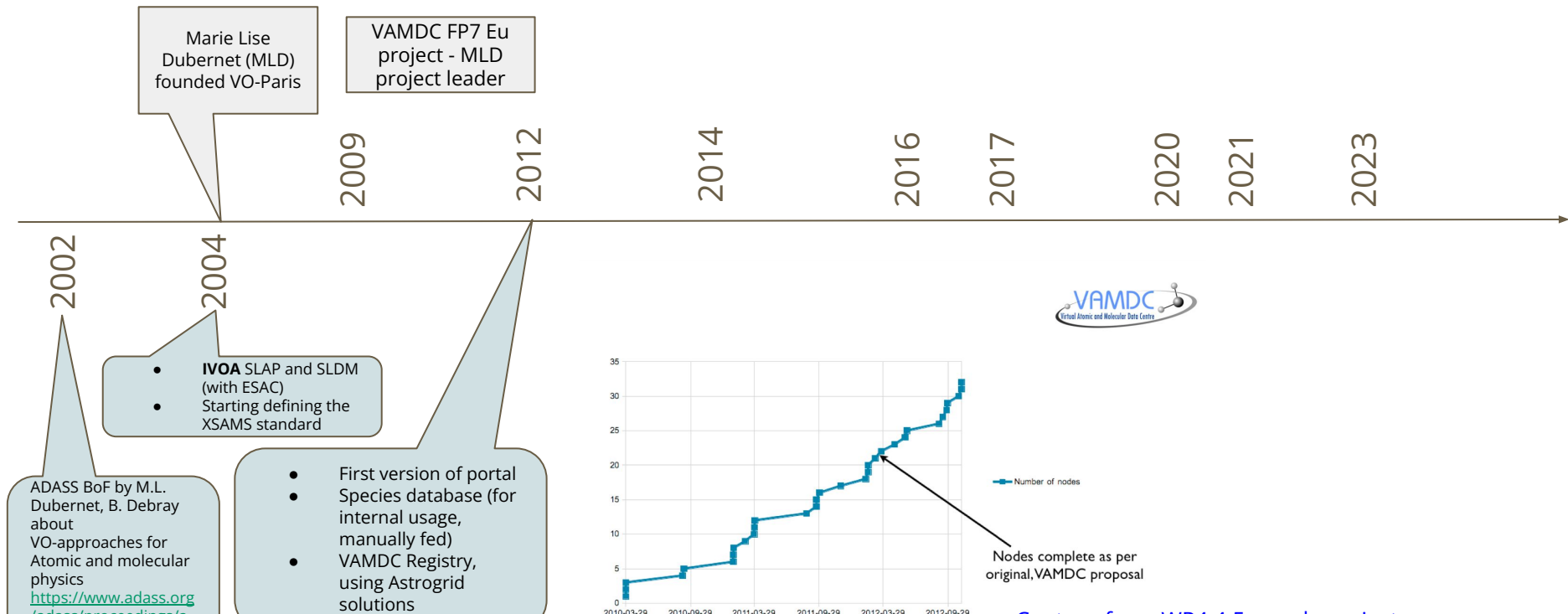
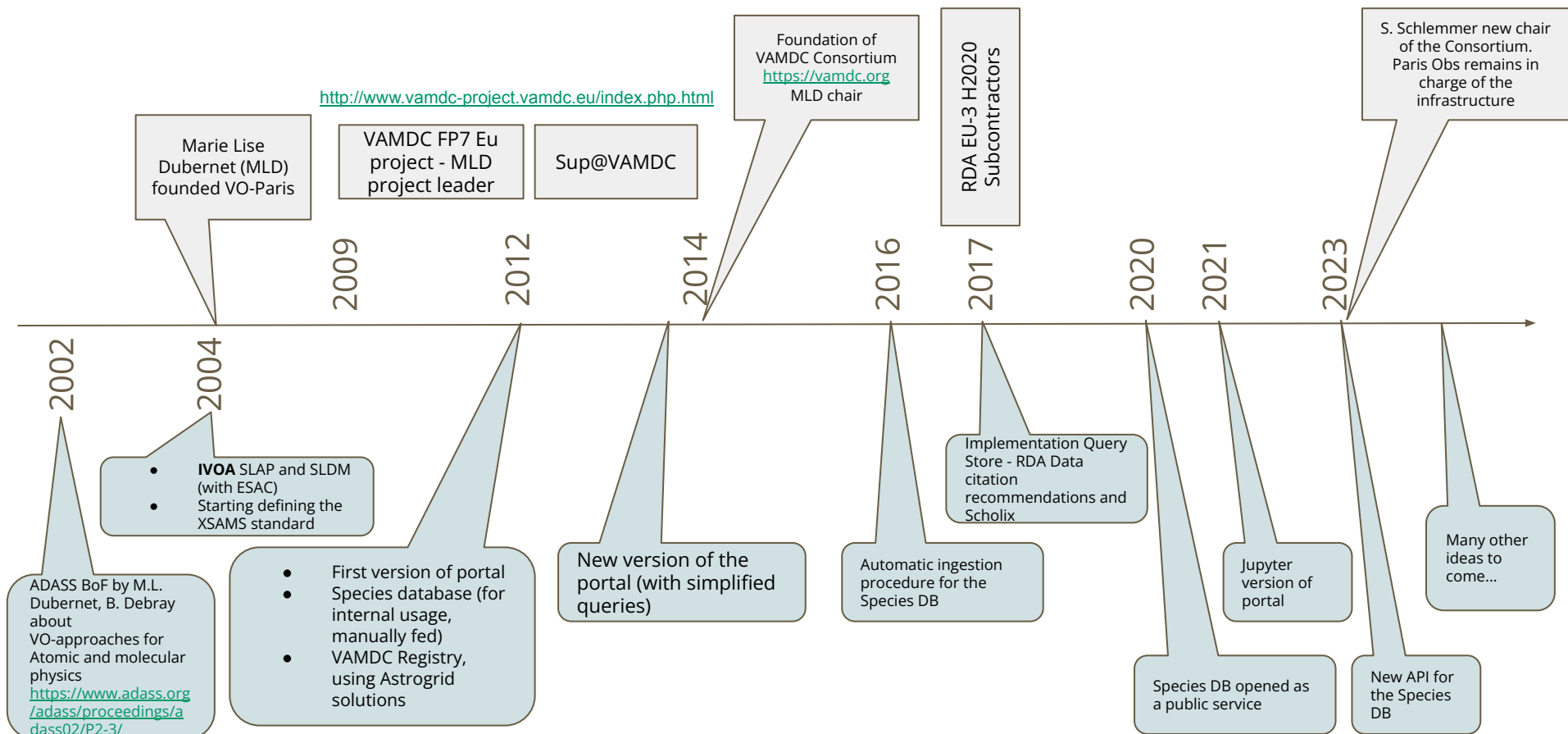


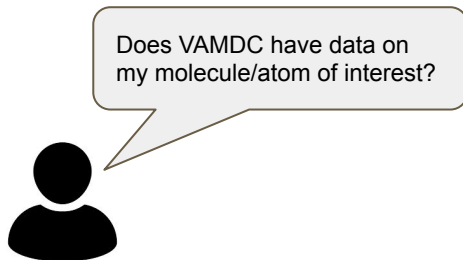
Figure 1: growth of VAMDC infrastructure, by count of data nodes

Capture from WP4 4.5 vamdc project deliverable

Perspective of a long ongoing process



The Species Database in a nutshell



VAMDC infrastructure

The Species Database in a nutshell

